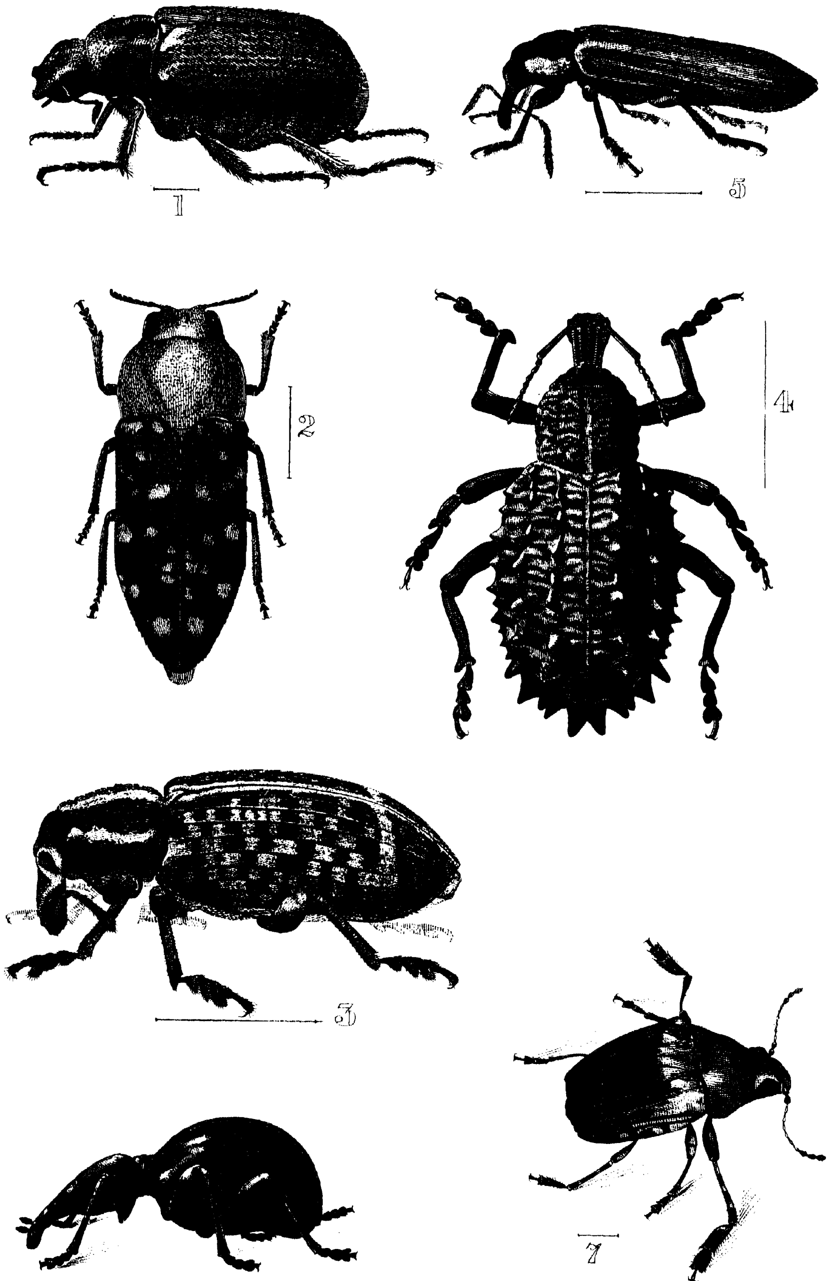
PLATE I.



INSECTS WHICH ATTACK WATTLE-TREES.

Fig. 1. Dipucephala aurulenta, Kirby.
2. Cisseis leucosticta, Kirby.
3. Chrysolophus spectabilis, Fab.
Fig. 4. Leptops tribulus, Fab.
5. Rhenotia hœmoptera, Kirby.
6. Myrmacicelus formicarius, Chev.
Fig. 7. Doticus pestilens, Olliff.

Insects of the Wattle Trees.

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IN the flora of Australia, one of the largest and most important groups of trees are those popularly known as wattles, belonging to the Genus *Acacia,* which not only cover many thousands of acres of our forest and scrub lands along the coastal districts, but are also scattered all over the ranges and plains of the interior where they are better known as myall, mulga, brigalow, yarran, gidgee, hickory, sally, and by a host of other names. In Mueller's *Systematic Census of Australian Plants,* published in 1889, no less than 340 different species of *Acacias* are recorded. So it is no wonder that with such an extensive range all over the continent of so great a variety of species, some little shrubs only a few feet high, while others, the giants of the group, attain a height of 100 feet and a diameter of over two in the trunk, they should be infested or visited by a great number of insects that feed upon their foliage, bark, timber, and even roots.

Therefore, as several of our wattles are of considerable value from a commercial point of view, on account of the rich tanning properties of their bark, which is not only universally used for making leather in this country, but is extensively exported, wattle scrubs when wel looked after should be a valuable asset to the State, besides employing labour in stripping, carting, and grinding up the bark.

We also find that many wattles, both when growing under natural conditions in the bush or cultivated in our gardens, are very short-lived trees, on account of insect infestation, so that any information to be obtained about the habits or life-histories of the pests is of value to the public, as it gives them some idea how to cope with them. It is with this idea that I have collected my notes, made during the last ten years, from actual observations in the bush when collecting specimens. Some years ago I proposed to publish my observations as a continuation of Mr. Maiden's pamphlet on "*Wattles and Wattle-barks*" (Technical Education Series No. 6, 1891), but the accumulated material has grown considerably since that date.

In the first publication of the Field Naturalists' Club of Victoria (*Southern Science Record,* 1880), Mr. D. Best contributed a very interesting paper on the "Longicorn Beetles of Victoria" in which he gave the more or less complete life-history of forty-six species. Mr. C. French's notes in the *Field Naturalist,* and papers on Economic Entomology, and my own papers in the *Proceedings of the Linnean Society of N.S.W.,* are the chief papers on this important branch of practical entomology.

Black or Green Wattle (*Acacia decurrens*, Willdenow).

As it is proposed to deal with all our common wattles in turn, I commence with this species and its variety *Acacia mollissima*, which has a very wide range over New South Wales, Victoria, South Australia, and Queensland.

Probably few trees are the food-plant or hunting ground of more insects or suffer more from their depredations than the black wattle, which besides being one of our most graceful and richly-blossomed trees is also of great commercial importance from the fact that it is from this tree that the bulk of the bark used for tanning purposes is obtained.

(I) Coleoptera (Beetles).

The Metallic-green Foliage Beetle. (Diphucephala aurulenta, *Kirby.*) (Plate I, fig. 1.)

[Kirby, *Trans. of the Linn. Soc.* XII, 1818, p. 400.]

This is a very plentiful little beetle which feeds upon the foliage in the early summer, and has a wide range over the country.

It is of a rich metallic green colour, with the thorax very rugose, and the wing covers coarsely and thickly punctured; the under surface is finely clothed with buff hairs, longest upon the thoracic surface. Length, 4½ lines.

The small Cockchafer (Anoplognathus flavipennis, *Boisd.*)

[Boisduval, *Voyage de l'Astrolabe*, Zool p. 176.]

This is one of the smaller cockchafers, measuring about 9 lines in length, with a dark metallic head and thorax, and light yellowish-brown wing covers; the under surface, rich metallic reddish-brown, with coppery reflections, and lightly clothed with grey hairs. This species is common about the Blue Mountains and Maitland district.

The Grey-striped Agrilus (Agrilus australasiæ, *L. & G.*).

[Laporte et Gory, *Monograph*, II, p. 21.]

This is a plentiful species upon the foliage of this wattle in the early summer in the Mittagong district where numbers can be taken by shaking the branches into a net or umbrella.

It is a slender beetle, measuring 5 lines in length; of a general dull metallic bronzy tint, with the sides of the thorax, a stripe along the sides of the abdominal segments, and both sides of the under surface grey; the legs and centre of the abdominal segments of the under surface of a reddish metallic tint. The wing covers are narrow, contracted (about the middle) on the sides and rounded at the tips.

The Small Black and Gold Flower Beetle (Cisseis cyanipes, *Saund.*).

[Saunders, *Trans. Entom. Soc.*, 1868.]

This is one of the smaller species, but in the early summer is pretty plentiful upon the foliage of the wattle scrub in the Mittagong district. It measures scarcely a quarter of an inch in length, but is stout in proportion to its length; the general colour is rich coppery red, with the centre of the wing covers clouded with black, the legs metallic green.

The White-spotted Flower Beetle (Cisseis leucosticta, *Kirby*).
(Plate I, fig. 2.)

[Kirby, *Trans. Linn. Soc.* 1818, p. 382.]

This beetle has a very wide distribution, being recorded in Masters' Catalogue from New South Wales, Victoria, and South Australia, and is also now listed from Queensland.

It feeds upon the foliage of the wattle, and is easily shaken down in the early morning, but flies or drops to the ground if disturbed in the heat of the day.

It measures slightly over half an inch in length; the upper surface of head and thorax rich metallic green, thickly and finely punctured; the wing covers rich metallic red, finely punctured, and lightly clothed with irregular small white spots. The under surface is of a duller green tint, with the legs very bright; the outer margin of the abdominal segment is blotched with grey pubescence. In the male the head and thorax is coppery red, and the coppery tint of the wing covers becomes dark purple.

The Pale Golden Flower Beetle (Cisseis similis, *Saund.*).

[Saunders, *Trans. Entom. Soc.*, 1846, p. 219.]

This beetle is taken in company with the last species upon the foliage, and has very similar habits, but is generally more plentiful about Mittagong than the former.

It is of a uniform reddish-coppery tint, with a finely laminated structure on the thorax and elytra that gives it a very bright metallic sheen. The under surface is of about the same tint as the upper, and is also finely punctured. It measures slightly over half an inch in length.

The Botany Bay Diamond Beetle (Chrysolophus spectabilis, *Fab.*).
(Plate I., fig. 3.)

[Fabricius, *System Entomologica*, p. 155.]

This large and handsome weevil was described in a few lines by Fabricius in his *System Entomologica*, p. 155, and since that date has been described and figured by several of our earliest entomologists. Donovan, in his *Insects of New Holland*, 1805, gives a very good coloured figure of the beetle, to which he affixes the popular but somewhat unwieldy name used by me at the heading. It has a wide distribution over Australia, probably as wide as its food-plant, but of the latter fact I have no exact record, and though odd specimens may be frequently taken upon allied forms of wattles, this is its regular food-plant both in the larval and perfect state.

The beetle varies in size from an inch to 8 lines in length, and is also variable in colour; those taken in the earlier part of the season being much more brightly tinted with green than later, as the scales are more or less rubbed off the beetles. Their general colour is black, with the sides of the snout, under surface of head, and three parallel bands down the thorax, rich metallic green. The wing covers are richly mottled with the same tint, forming irregular markings, blending together on the sides and under surface of the body, which is almost completely sheathed in these scales. The thorax is deeply punctured, and the wing covers regularly striated.

The female, when laying her eggs, generally attacks the stem of the tree just above the surface of the ground, where she gnaws the bark into little roughened spots, under each of which is deposited an egg. Where there have been a number of eggs deposited the bark has the appearance of having had a charge of shot fired into it. The larva, when hatched out, feeds down into the main roots, which, as it increases in size, it completely hollows out, packing up the chamber behind with the castings as it works along. When full-grown, the larva is a short, thick, fleshy, much-wrinkled, white grub, with three pairs of stout legs covered with short reddish hairs, a shining ferruginous head armed with stout black jaws. The life-history is completed in the year under ordinary conditions, though some belated individuals may come out later in the season.

I have also bred it out of the roots of five other acacias growing in the neighbourhood of Sydney. At certain seasons this beetle is very plentiful about the bush, and dozens can be taken in the course of an afternoon where there is a plentiful growth of young wattles.

The Large Black Weevil (Leptops tribulus, *Fab.*). (Plate I, fig. 4.)

[Fabricius, *System Entomologica*, p. 153.]

This beetle differs very much in size in the sexes, as the male measures only 9 lines and is slender in proportion, whereas the female is slightly over an inch in length, with the body nearly double the size of the male. The whole insect is black, with a dusty reddish tint on the upper surface; the snout is short, stout, and ridged; the thorax short, small, rounded in front, coarsely rugose, with a parallel cleft in the hind margin; the wing covers transversely rugose, with three parallel rows of short, stout spines down either side of the wing covers. On account of this rough spiny exterior, it was described by the late Sir William Macleay under the name of *Leptops echidna*.

It is widely distributed over Australia, and usually found feeding upon the young foliage. I know nothing about the larvæ of this weevil, but it is quite probable that they feed upon the roots of the trees.

Vine-cane Weevil (Orthorrhinus Klugi, *Bohem.*).

[Boheman, Schh., *Genera Curculonidæ*, III, p. 246.]

The larvæ of this beetle feed in the dead branches of the wattle, burrowing down the centre of the wood, pupating at the end of the chambers. I have given an account of its life-history in the *Proceedings of the Linnean Society, N.S.W.*, 1894, from specimens taken at Carlingford, near Sydney. It was noticed many years ago as a vine pest in the Parramatta district by Sir William Macleay, and in a former number of the *Gazette* (Pt. I, 1898) I figured and described the damage it does to the vines about Fairfield and other districts.

The beetle is under 4 lines in length, of a general reddish brown colour from a thick coat of fine bronzy scales, and is ornamented with two conical projections in front of the thorax, and a double row of three more on either side of the wing covers.

The Two-spotted Weevil (Belus bidentatus, *Donov.*).

[Donovan, *Insects of New Holland*, 1885.]

This is another very distinctive beetle that was figured by Donovan from specimens probably taken about Sydney, though it has a very wide range over Australia. It is usually found clinging to the foliage of the wattle, upon which it feeds, and falls very readily at the least alarm, so it is easily caught by shaking the bushes over a net or umbrella.

It is one of the largest of the genus, measuring about 10 lines from the front of the head to the tip of the wing covers, but the turned-down slender snout measures at least 2 lines more. In shape it is much more swollen on the sides and attenuated at the tips of the wing covers, that run out into two slender truncated tails, than any of the other species.

Its general colour is chocolate brown, with golden yellow stripes on either side behind the eyes and down the centre of the thorax, and two rounded spots of the same colour on the elytron, about two-thirds down from the shoulders. The under surface and legs are clothed with fine grey hairs.

I do not know anything about the life-history of any of the species of this genus, but Mr. French has recently figured this and four others as apricot beetles, and says that "the beetle first bores a hole with her snout, then deposits an egg in the hole, and finally pushes the egg to the bottom."* "The larvæ are soft, yellowish-white grubs without feet, and upon hatching from the egg at once commence to bore and tunnel." This beetle is common about Sydney, Mittagong, Bathurst, and many other districts.

The Brown Weevil (Belus brunneus, *Guer.*).

[Guerin, *Voyage de Coquille*, p. 108, 1830.]

This is a smaller species, not uncommon on the wattles in the same situation as the former species, and I have shaken it out of the foliage in company with several other species in the wattle scrub about Mittagong. In *Master's Catalogue* the locality given is Australia. It measures slightly over 4 lines in length, and has the whole of the upper surface reddish brown, finely roughened, and delicately clothed with fine grey hairs along the inner margins of the wing covers, forming a parallel stripe down the centre of the back. The under surface of the head, thorax, and abdominal plates are thickly clothed with fine silvery-grey pubescence, but the legs, antennæ, and snout are brown and almost naked. This weevil has a somewhat short thorax, and the wing covers and abdomen are nearly cylindrical and broadly rounded at the apex.

The Slender Weevil (Belus sparsus, *Germ.*).

[Germer, *Linn. Ent.* III, p. 206.]

I have collected this beetle by shaking the foliage of the black wattle at Capertee, Rylstone, and Bathurst, N.S.W. In the original description it was listed from South Australia.

* *Handbook of Destructive Insects of Victoria*, Pt. III, p. 45, pl. xxix.

It is longer than the last species, measuring 6 lines in length, but is more slender, and the tips of the wing covers more pointed. The general colour is the same, but the wing covers are strongly ridged on either side, and finely punctured with (in freshly emerged specimens) a double parallel row of fine pubescent spots on either side of the elytron, but in older specimens these are frequently rubbed. On the under surface the segments from beneath the head to the tip of the abdomen are clothed with fine white pubescence, densest on the sides.

The Rugose Weevil (Belus edentulus, *Lea.*).

[Lea, *Proc. Linn. Soc.* N.S.W., p. 600, 1898.]

A slender, dark, pitchy-brown coloured beetle, with the under surface somewhat darker, and the legs and antennæ reddish brown. It measures 5 lines in length, with the body somewhat cylindrical, the upper surface very thickly and finely punctured, lightly mottled with greyish pubescence down the centre of the elytra, which come to a point at the apex, and, under a lens, show a fringe of fine hairs along the outer margin at the tips. The outer margins of the eyes are lightly fringed, and the sides of the head, thorax, and abdominal segments thickly clothed with silvery grey pubescence. The type specimen was described from Braidwood, in the south. My specimens were taken on a wattle at Warialda, in the north, so that it has a wide range over this State.

The Tailed Weevil (Belus phœnicopterus, *Germ.*).

[Germer, *Linn. Ent.*]

This beetle was originally described from South Australia, but is plentiful in this State, and common on the wattles about Mittagong, where I have shaken numbers out of the foliage of the wattles.

This weevil is one of the larger ones, measuring 9 lines in length, without counting the slender snout. It is of a uniformly dark chocolate-brown over the dorsal surface, with only the sides of the under surface of the head, thorax, and abdomen thickly clothed with fine white hairs; the legs, antennæ, and the rest of the ventral surface deep reddish brown. The thorax is broad, roughly punctured, and furrowed with a medium suture; the elytra thickly punctured, with the extremities produced into slender tails.

The Spotted Weevil (Belus semipunctatus, *Fab.*).

[Fabricus, *System Entomologica*, p. 135.]

This is a rather plentiful species. I have taken it on wattles about Sydney, Mittagong, and Bathurst. In *Master's Catalogue* it is recorded generally from Victoria and New South Wales. It is much more variable in size than any of the preceding species, measuring from 5 to 7 lines in length. Its general colour is dark reddish brown, with much lighter coloured antennæ; the thorax is broad, angular, and rugose, with a deep central suture; the wing covers finely punctured, with a raised parallel ridge on either side of the medium suture of the wing covers, with another somewhat more indistinct one on the outer edge, and produced into slender points on

either side at the tips; the whole of the wing covers mottled with yellowish grey hairs that, forming small spots, produce double parallel lines of spots on either side of the wing covers. The under surface is similarly clothed with grey hairs as that of the preceding species.

I believe that most of the species of the genus *Belus* will be found to feed upon this or other species of wattles, but these are the only species of which I have records of the food plant as *Acacia decurrens*. About forty species are described from all parts of Australia.

The Red Weevil (Rhinotia hœmoptera, *Kirby*). (Plate I, fig. 5.)

[Kirby, *Trans. Linn. Soc.*, Vol. VII., 1817, p. 427.]

This handsome weevil was described and figured in a paper entitled "A Century of Insects, including several new genera described from my cabinet." Among these insects there are a number of Australian beetles.

This beetle varies considerably in size, measuring from 8 to 10 lines in length, without including the stout turned-down snout; the general colour is rich, shining black, with a stripe on either side of the eyes, a slender one in the centre of the thorax, another broad blotch on either side, and the whole of the wing covers deep rich orange red. The general form is slender and somewhat cylindrical, broadening out beyond the centre, and rounded at the tips; the whole of the elytron very finely striated and granulated.

The beetle lays its egg in a scar on the bark of a branch not much thicker than one's finger, and the tiny larva, when hatched, bores into the centre, burrowing down through the middle for some inches, causing the bright green bark to turn yellow. The larva is a rather curious-looking creature, of a dull, light yellow colour, with a small head, and the thoracic segments swelling out and forming a prominent forehead or ridge, tapering down to the jaws; the abdominal segments of a uniform size, slender, rounded with the anal segment, broad, truncate, and shining.

I have cut them out of *Acacia decurrens* and *A. pubescens*, but their common food plant is *Acacia suaveolens*, about the Sydney scrub. I have taken both larvæ and beetles out of the stems in May, and, as they are seldom met with on the foliage until October, the fully-developed beetle must remain a considerable time in its chamber before it gnaws its way out. The beetles feed upon the foliage of a number of different scrub wattles besides *Acacia decurrens*.

The Ant Weevil (Myrmacicelus formicarius, *Chev.*). (Plate I, fig. 6.)

[Chevrolat, *Ann. Soc. Entomol.*, France, p. 359, t. 15, 1883.]

This is a queer-looking ant-shaped weevil that crawls about on the trunks and foliage of the wattle, and is often taken in the net when shaking a bush. It only measures 2 lines in length to the front of the head, but the stout turned-down snout measures another half-line. It is of a uniform black colour, smooth, and shining, with the head and snout broad; the thorax oval, very narrow at the junction with the body, which swells out into an elongate oval; the legs long, with the thighs thickened in the centre.

This beetle has a wide range over Victoria and New South Wales, and has been described under several different names by the earlier entomologists.

The Little Black Weevil (Læmosaccus sp.).

This little weevil feeds upon the foliage of the wattle, and may be shaken down with other small insects in the early summer months. My specimens were obtained in this way at Mittagong. Most of the members of this genus are taken upon freshly-fallen tree trunks, where they lay their eggs in the dying bark.

The general colour of this beetle is black, mottled with white, having a stripe of the latter colour on the sides and a smaller one on the hind margin of the thorax, a blotch in the centre of the wing covers, and three smaller spots at the extremities; on the under surface the sides of the abdominal segments are marked with white. It measures about 2 lines in length.

The Jumping Anthribid (Doticus pestilens, *Olliff*). (Plate I, fig. 7.)

There are several species of wattles that are attacked by what I believe in the first instance are fungus growths upon the young trees; these never become any size, forming rusty brown lumps on the shoots; but in the larger trees they often appear all over the branches, forming irregular rounded masses larger than a man's fist. Many of the black wattles along the coastal districts are so badly infested that they are speedily killed.

These woody lumps are used by the larvæ of both moths and beetles as food, and the short stout grub of this curious little beetle is very easily bred out of them.

Specimens of this beetle were first brought under notice by Mr. French sending some to the late Mr. Olliff from Victoria, with the information that they destroyed apples. The latter decided that it was an undescribed species, and furnished Mr. French with the name by which it is now known, but I am not aware that he ever published a scientific description of *Doticus pestilens*. I have frequently bred this beetle out of shrivelled apples left hanging over the winter in orchards about Sydney, but never knew it to do any damage to green or ripe fruit, though it is a common and widely distributed beetle in New South Wales.

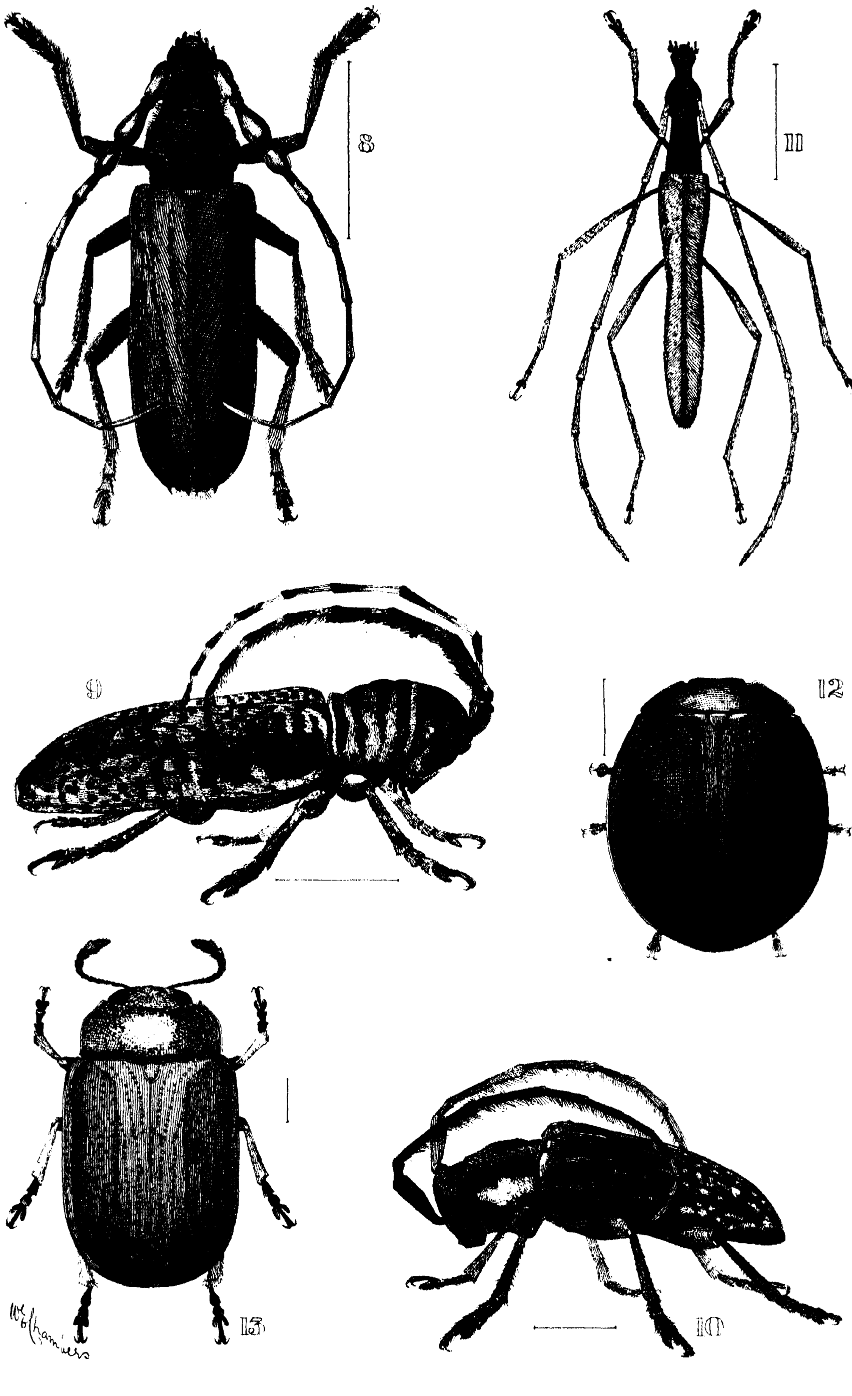
The grub is pale yellow, clothed with fine hairs, and measures slightly over 2 lines in length. The head is small, almost buried in the thorax, with small jaws tipped with two pointed teeth.

The beetle measures about 3 lines in length, of a general dark brown colour, covered with greyish down. Its fore legs are very long in proportion to the hind pairs, with abnormally large tarsi, and it jumps in a very peculiar manner when touched.

Metallic Violet Longicorn (Iotherium metallicum, *Newm.*).

[Newman, *Entomol. Mag.*, V., 1838, p. 493.]

This richly-tinted beetle has been recorded from Tasmania, New South Wales, and Victoria. I have taken it on grass stalks and upon *Acacia decurrens* about Bathurst, Port Macquarie, Maitland, and other



INSECTS WHICH ATTACK WATTLE-TREES.

Fig. 8. Pachydissus sericus, Newm.
9. Symphyletes vestigialis, Pasc.
10. Hebecerus marginicollis, Boisd.
Fig. 11. Lygesis mendica, Pasc.
12. Paropsis immaculata, Marsh.
13. Calomela paralis, Lea.

localities. The smaller male insect was described by Pascoe under the name of *Phaolus Macleayi* in the *Transactions of the Entomological Society*, 1863, among a number of other unnamed Australian insects sent to him by the late Sir William Macleay. The sexes vary considerably in size, the male measuring about $4\frac{1}{2}$ lines, and the female nearly 8 lines in length. The general colour is deep metallic violet, with coppery tints upon the wing covers; the head broad, antennæ short, stout; the thorax sloping out on either side, forming a stout spine in the centre; the abdomen broad, rounded at the tip.

The Silvery Brown Longicorn (Pachydissus sericus, *Newm.*).
(Plate II, fig. 8.)

[Newman, *Entomol. Mag.*, Vol. V, p. 494.]

Next to the large goat moth this beetle does the most serious damage to several species of wattles, the larvæ burrowing beneath the bark and sapwood in the earlier stages of their existence, but afterwards burrowing deep into the solid wood, and many of the old wattle trees when dead are found to be honeycombed with their chambers when the bark is stripped off the trunk. The larva is of the usual flattened form, measuring nearly 2 inches in length, with stout black jaws, and pupates in the end of its excavation.

The beetle is a very distinctive insect on account of the second and third joints of the antennæ being very much swollen out at the apex; the general colour is light chocolate brown, but covered with a pubescence that gives it a rich silvery tint; the thorax is stout and roughened, and the tips of the elytra are sharply cut out, forming two fine spines on either side. It measures about 14 lines in length.

The Slender Grey Longicorn (Didymocantha obliqua, *Newm.*).

[Newman, *Ann. Nat. Hist.*, Vol. V, p. 20, 1840.]

This beetle was described in a paper on *New species of Cerambycidæ from New Holland and Van Diemen's Land*, in which the author described twenty-five new species of our longicorns. In the same year Hope read a paper before the Zoological Society of London, in which he described the same beetle under the name of *Strongylurus varicornis*.

This beetle is more a resident of the northern parts of this State and Southern Queensland, and as far as I know not common about Sydney, but I have taken several in the Maitland district, feeding upon the foliage. It has a curious habit when disturbed of letting its long antennæ droop down on either side in a most comical manner, and then stretches out its legs ready to drop to the ground if further startled.

It measures 9 lines in length, with long slender antennæ 15 lines long; general colour chestnut brown, the apex of the second, third, and fourth joints of the antennæ black, scutellum white, and the elytra marked with dark indistinct brown lines on either side. The thorax narrow, hairy, armed with a spike on either side; legs long, slender, and hairy.

Slender Grey-haired Longicorn (Lygesis mendica, *Pascoe*).
(Plate II, fig. 11.)

[Pascoe, *Ann. and Mag. of Nat. Hist.*, 1875, Vol. XV.]

A number of specimens of this little longicorn were bred from the infested twigs of a black wattle, cut off a tree at Carlingford, near Sydney, some emerging in August, but the remainder towards the middle of November.

The beetle measures under half an inch in length, of a uniform reddish brown colour, with a slender head and long cylindrical thorax. The wing covers rounded at the tip, and the whole insect clothed with stout white hairs, and the legs swollen on the lower portion of the thighs.

The Triangular-marked Longicorn (Uracanthus triangularis, *Hope*).

[Hope, *Trans. of the Zool. Soc.*, Vol. I, p. 108.]

The life-history of this fine longicorn was first recorded by Mr. D. Best in a paper published in the *Southern Science Record*, 1880–1, entitled *Longicorn Beetles of Victoria* in which forty-six species are listed. He states that its larvæ feed chiefly upon *Acacia decurrens*, but it is also found feeding in the stems of *Banksia integrifolia* (Honeysuckle) and *Acacia longifolia*, so that French has given it the name of the "Triangular-marked Banksia Beetle." I have bred a considerable number about Sydney from the stems of *Eriostemon lanceolatus*, and *Boronia pinnata*, but have also had infested wood of the black wattle from Mr. J. H. Maiden which contained this beetle.

The larva is of a bright yellow colour, long and somewhat cylindrical, but deeply corrugated at the segmental divisions, each segment being rounded and lightly clothed with reddish hairs; an impressed line runs down the dorsal surface that causes the segments to form a rounded lump on either side, the anal extremity rounded with five short spines at the apex. They feed down through the centre of the branchlet, hollowing it out as they go, and sometimes eating through the sides, finally pupating at the end of the chamber.

The beetles are not at large till November, though I have cut them out of a branch perfectly formed as early as June. It has a wide range over New South Wales; I have specimens from Sydney, Newcastle, and Wilcannia.

It is the most distinctive species of the genus, measuring up to 1¼ inches in length, slender and cylindrical in form, with an elongated thorax tapering to the head. The general colour is reddish brown, but the head, thorax, and shoulders are so thickly clothed with buff-coloured—and the apical portion with grey-coloured—hairs that it has a much darker appearance; on either side of the outer margin of the wing covers is an elongated angular space, smooth and shining, and not clothed with hairs.

The Slender-lined Longicorn (Syllitus grammicus, *Newm.*).

[Newman, *Ann. Nat. Hist.*, V, 1840, p. 21.]

This pretty little longicorn is only 4½ lines in length and slender in proportion, of a general light reddish brown colour, with the head and

thorax darkest. The wing covers are daintily marked with six white parallel ribbed lines running from the shoulders to the tip of the abdomen.

The larva bores narrow irregular chambers along the smaller branches, chiefly found in the dead wood up to the middle of December. It is commonly taken by shaking the bushes over an umbrella; I collected a number among the foliage on the Tweed River in the end of October. This species was noted in my paper on *The Life-Histories of Australian Coleoptera* in the Proc. of the Linn. Soc., N.S.W., 1894.

The White-cheeked Longicorn (Hebecerus marginicollis, *Boisd.*).
(Plate II, fig. 10.)

[Boisduval, *Voyage de l'Astrolabe*, II, p. 490, 1835.]

This and the two following species are very plentiful upon the foliage of the wattle in the early summer, where they cling to the small branchlets and feed upon the bark. The larvæ of the three are very similar in appearance and habits; the eggs are laid in the bark on the smaller branches in the dead or dying wood, the young larvæ when hatched out feeding in the sapwood in which they tunnel in an irregular manner, finally pupating in a small oval chamber at the end of the cavity.

The larva is of the usual semi-transparent colour, slightly brownish, fringed with fine hairs on the margins, head large, rounded in front, with stout ferruginous jaws, black at the tips; the last two segments of the abdomen smooth, cylindrical, rounded at the apex.

The beetle measures up to 7 lines in length, and is stout and thick-set in proportion, with the thorax broad and the tip of the abdomen rounded. The general colour is very dark brown, the antennæ clothed with fine black hairs along the inner margin; sides of thorax finely punctured, lightly clothed with dark hairs, and a broad distinctive stripe of pale yellow pubescence on either side in a line with the base of the antennæ. The wing covers are both striated, and more coarsely punctured than the thorax, and lightly clothed with spots of the same dull yellow pubescence, which is much thicker on the under surface of the abdominal segments.

This species was described in *Dejean's Catalogue* (3rd edition) on page 362, under the name of *Acanthocinus marginicollis*, and was redescribed by Boisduval, the French naturalist attached to the scientific expedition which sailed round the world in the "Astrolabe" in 1830. This ship stopped at a number of places along the Australian coast, collecting and buying specimens, so that quite a number of Australian insects are described and figured in Zoological Monographs published by the French Government. It is common about Sydney, Bathurst, Mittagong, &c., and has a wide distribution over Australia.

The Dark Grey Longicorn (Hebecerus Australis, *Boisd.*).

[Boisduval, *Voy. de l'Astrolabe*, II, p. 489, 1835.]

This is the largest of the three species, measuring up to 7 lines, but is much stouter than the preceding one; the general colour is even

darker, the antennæ fringed with longer hairs, head and thorax very finely and thickly punctured, the latter being produced into a stout spine on the sides; the dorsal surface of the elytra thickly and coarsely punctured and lightly clothed with grey and buff pubescence.

This beetle is often found upon the trunk of wattle trees, as well as upon the branches, and is not as plentiful as the smaller species; its colouration is so close to that of the wattle bark that when at rest it needs a sharp eye to detect it. I have collected it all over the country, and it ranges into the other States.

The Little Grey Longicorn (Hebecerus crocogaster, *Boisd.*).

[Boisduval, *Voyage de l'Astrolabe*, II, p. 492, 1835.]

This is the smallest of the three species, measuring only a little over 3 lines in length, with general uniform dark brown tint; the thorax very finely granulated, and the wing covers thickly and coarsely punctured, with a slight clothing of dull yellow pubescence. The antennæ are very distinctive, being very long; stout, clothed with hairs, variegated in grey and black, each band of the latter colour forming a rounded mass in the centre.

The larva is of the typical form, and lives and develops in the dead branches of this and several other species of wattles growing about Sydney, and some of the larvæ remain over two years in the infested wood, though probably in the usual course their life cycle would be completed in a year. Like the other species it has a wide range over Australia, and is very plentiful upon the young foliage in early summer.

The Buff-painted Longicorn (Symphyletes vestigialis, *Pasc.*)
(Plate II, fig. 9.)

[Pascoe, *Journal of Entomology*, Vol. II, p. 226, 1864.]

I have taken a number of this fine species clinging to the twigs of the wattles growing in the Mittagong district. It measures nearly three quarters of an inch in length, and is of the usual cylindrical form with rounded abdomen. Its ground colour is black or very dark brown, but is so thickly clothed with rich buff-coloured hairs or pubescence (also clouded with white on the edges of the wing covers, which are again covered with small round hairless spots) that it has a mottled pattern all over the elytron. The antennæ are large, and starting from the second joint are banded with black and white; the whole clothed with fine black hairs along the inner margin.

This beetle probably lays her eggs in the bark, and may girdle the twig, but I have never identified the larva; but most of the members of the genus have this habit.

The Dark-green Calomela (Calomela Curtisi, *Kirby*).

[Kirby, *Trans. Linn. Soc.*, XII, p. 473.]

This species and its larva has similar habits to the following one; the beetle is about the same size. The head, eyes, antennæ, thorax, and legs are orange yellow, the latter mottled with dark blue, and a small transverse line of the same colour in the centre of the thorax; the wing covers dark metallic blue, thickly covered with fine punctures.

This species was figured and described by Kirby, and again by Boisduval in the *Voyage de l'Astrolabe*. This wattle species is much smaller than the typical one, and may be a variety.

The Light-coloured Calomela (Calomela paralis, *Lea.*).
(Plate II, fig. 13.)

This, like the preceding species, is very plentiful upon the foliage upon which the larvæ feed; the latter are of a dark green colour, with the head, thorax, and legs black; the head is small, thorax narrow, abdomen large, globular.

The beetle measures about 2½ lines in length, the general colour dark orange yellow, with a broad parallel band of rich metallic green on either side occupying the centre of each wing cover, and tapering out at the extremities, deeply and finely punctured.

The Fire-blight Beetle (Paropsis orphana, *Erich.*).
[Erichson, *Wiegman's Archives*, Vol. I, p. 229, 1842.]

This was first described by Chapuis in the *Annals of the Society Entomologica* of Belgium, 1877, and though originally described from specimens collected in Tasmania, is common in Victoria and New South Wales. Though one of the smallest members of this large genus of plant-eating beetles, it is one of the most destructive in the grub state, when it appears in any numbers. Some years ago (1890) the larvæ appeared in such immense numbers in many wattle plantations in Victoria that the trees were defoliated. As nobody had noticed the larvæ it was looked upon as a new disease and popularly called "fire-blight," until the Government Entomologist (Mr. French) investigated the matter, and found the trees swarming with small dirty green grubs.

Specimens of these which were forwarded by Mr. French were exhibited by me at a meeting of the Linnean Society, N.S.W., and until I bred out the beetles I was under the impression that they were the larvæ of an undetermined sawfly.

The larva is a slender caterpillar, quite unlike most of those of the common species of Paropsis, varying from dull brown to green in colour, with two pale parallel lines running down the dorsal surface from behind the head to the tip of the abdomen, and, as they assimilate both in colour and shape to the twigs and foliage among which they are feeding, they very easily escape notice.

The Red Wattle-paropsis (Paropsis immaculata, *Marsham*).
(Plate II, fig. 12.)
[Marsham, *Trans. Linn. Soc.*, Vol. IX, 1808.]

In a lengthy paper on the genus *Noctolia* (from which Paropsis was separated by Hubner), Marsham described and figured eighteen new species from Australia, and though his descriptions are clear, if brief, the figures are poor. This is one of the commonest beetles on the wattles all over the country, and has a very wide distribution.

The beetle measures 6 lines and is broadly rounded, its diameter being 4½ lines; general colour deep reddish brown, the margin of the

wing covers much lighter than the upper portion of the dorsal surface, which often shows also as a pale stripe down the centre of the back when the insect is alive; but in dead specimens the general tint is dull black with the stripes broad, and thorax reddish brown. The lower portion of the thorax in line with the eyes deeply punctured, upper portion smooth and shining; the wing covers lightly marked with fine punctures, thickest on the sides, the whole otherwise smooth and shining.

The larva feeds upon the foliage, and is a stout, short grub, broadly rounded on the dorsal surface, with the apex of the abdomen somewhat pointed. Its general colour is yellow tinted with green, the upper surface of the head and first thoracic segment striped with black, and the whole of upper surface of the remaining segments curiously mottled with round black dots; on the second and third thoracic segment and the first two or three abdominal ones these dots are thickest, but taper off on the sides to the apex.

The Golden-haired Leaf Beetle (Elaphodes tigrinus, *Chap.*).

[Chapuis, *Soc. Entomologique*, Belg., XVIII.]

This pretty little beetle is very plentiful upon the foliage in the early summer months all about the coastal districts. It measures under two lines in length, oval in form, with the head tucked in under the thorax; the head and thorax chestnut brown, with the wing covers lighter reddish brown, mottled with darker brown, and lightly clothed with short golden hairs, which also extend over the face and under-surface.

The Tricoloured Leaf Beetle (Cryptocephalus sp.).

This brilliant little beetle is common on the foliage in company with the former, but is much more active and ready to fly when shaken down. It measures two lines in length. The centre of head, sides of thorax, portion of legs, and under surface are a dull orange yellow; antennæ, tarsi, portion of thighs, ring round head and centre of thorax black; wing covers finely rugose, deep rich metallic green.

(II.) Lepidoptera (Moths).

The Wattle Goat-Moth (Zeuzera Eucalypti, *Boisd.*).

[Boisduval, Herr.-Schaff, Lepid. Exot. Sp. Ser. 1, f. 164.]

It is rather unfortunate that our commonest and most destructive goat-moth in the plantations of wattles should have been given the specific name of *Eucalypti*, whereas there are several other members of this fine genus that do frequent the Eucalypts, while this species confines its attention to the wattles. But as our earlier describers knew nothing about the life-histories or habits of the foreign insects they described, this sort of mistake was of common occurrence.

This goat-moth caterpillar destroys an immense number of fine wattles both in our gardens (where cultivated wattles of all kinds seem more delicate and susceptible to insect attacks), as well as in the forest

and scrub. I have cut both larvæ and pupæ out of *Acacia longifolia*, *A. pycnantha*, and *A. decurrens*, growing in the neighbourhood of Sydney, and the moth is very easily bred out if the pupæ are carefully collected at the proper season of the year.

The eggs are laid upon the surface of the bark, through which the little caterpillar gnaws its way into the centre of the stem or branch, having formed when nearly full grown a tunnel as large as one's finger, in which it finally pupates, lining with a thin silken skin inside the base of the chamber. But the chamber is always so constructed that the head of the chrysalid is almost touching the outside bark, which dries, and is simply pushed off at the opening when the moth is ready to emerge. At first the larva is a pinkish tinted grub, but as it reaches maturity it becomes almost white. In the larger trees the grub commences its attack from the stem close to the ground, and generally works upwards; when, however, it works downward, it sometimes comes out and forms its silken cocoon against the trunk of the tree, just under the surface of the earth. The larval covering is always found projecting from the chamber after the moth has escaped.

Where a tree is badly infested with these large grubs, if it does not die, it is so weakened by their actions, that it is frequently blown over or broken down by the wind.

In old times these grubs were much sought out by the blacks, who looked upon them as tit-bits, and from their size they make a nice mouthful. Many bushmen also look upon them as a dainty dish, quite as good as a large fat oyster. It was asserted that the larva of an allied species of goat-moth, known as *Cossus*, formed a favourite dish at the banquets of the Roman epicures, but the cossus of ancient writers is now said to have been the larva of a wood-boring beetle.

The moth is very variable in its markings, and there is a considerable difference in the size of the sexes, the female being the larger. The male measures about 2½ inches from the front of the head to the tip of the abdomen, and has a wing expanse of about 5 inches. The general colour is greyish-white, mottled and variegated with irregular blotches and bands of white, grey, reddish-brown, and black, the abdomen thickly clothed with brown hairs, and the antennæ beautifully pectinate, but that of the female simple and thread-like.

McCoy, in his "Podromus of the Zoology of Victoria," has figured and described the habits of this moth in that State, where it is said to almost confine its attacks to the black wattle. I have also noted it in my account of "Wood Moths; with some account of their Life-Histories," in the *Proceedings of the Linnean Society, N.S.W.*, 1894. French has recently included it in his "Handbook of Destructive Insects of Victoria," p. III, 1900; and many notices of it have appeared in the writings of travellers in Australia.

There is some doubt about the correctness of this name; some lepidopterists state that this is *Zeuzera d'Urvillei* of Herrick-Schafer, and that the smaller lighter-coloured species, not so common about Sydney as it is further south, but also a wattle moth with similar habits, is the true *Zeuzera Eucalypti*.

Imperial Blue Butterfly (Ialmenus evagorus, *Don.*).
(Plate III, fig. 15.)

[Donovan, *Insects of New Holland*, 1805.]

In Olliff's pamphlet, "Australian Butterflies," this beautiful little blue butterfly is called by the above name, which, for want of a better, I have here used, though among the "Blues," there are some much more imperially coloured butterflies. This is one of the commonest species of the *Lycænidæ* in the wattle scrubs along the coast, and sometimes the trees are completely stripped of their foliage by the greasy legless olive-green to brown coloured larvæ, which are generally noticed by the swarms of ants running over them, attracted by the secretions upon their slimy bodies. In return, the presence of the ants protects them from insectivorous birds and other enemies, though, in spite of this protection, a percentage are destroyed by a small parasitic wasp (*Braconidæ*) that deposits its eggs upon the caterpillars. The full grown caterpillars pupate on the twigs of the wattle, sometimes in great bunches, which, after the butterflies have emerged, hang up like bunches of brown grapes. In favourable weather the chrysalid state lasts for about a week, the butterflies being plentiful in January and February. The butterfly measures 1¾ inches across the wings; on the upper surface the ground colour is black, with the centre of the fore and hind wings delicate metallic blue; the extremities of the hind wings produced into scalloped tails, three in number, with the central one longest; at the base of these tails are spots of rich orange red. The under surface of the wings are delicate greyish-brown, finely edged with black, followed with an inner one of salmon-pink, which is shaded by dark brown, all merged into the reddish spot at the base of the tails on the hind wings; the inner portion of the wings marbled with irregular parallel narrow black bands or bars, and smaller dots.

This butterfly has a wide range over South Australia, Victoria, New South Wales to Brisbane, Queensland.

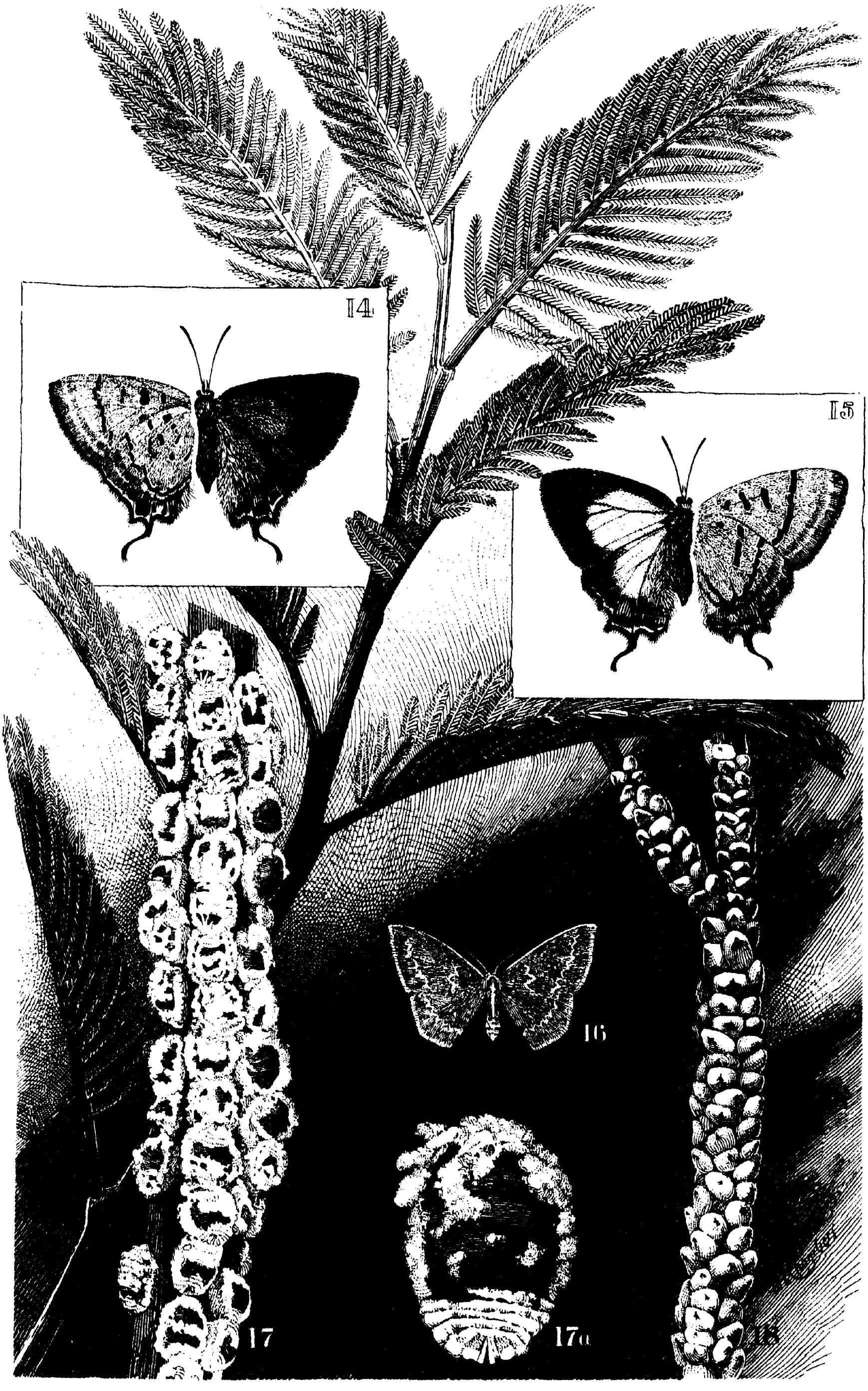
The Paler Blue (Ialmenus ictinus, *Hew.*).
(Plate III, fig. 14.)

[Hewitson, *Illustrations* of *Diurnal Lepidoptera*, 1862-78.]

This species takes the place of *I. evagorus* away from the coast, and is the common species about Mittagong and further inland. In its habits it is identical with that butterfly, so that the description of one does for the other.

The butterfly differs from the last-named species in having the upper surface of the wings dark brown, the blue colouration in the centre of the wings smaller, without the whitish tint in the former; the under surface of the wings more yellowish-brown in tint, and the dark markings much more delicate. It ranges from Victoria to Cardwell, in North Queensland. I have also collected a variety of this species in the western country, near Condobolin, on *Acacia pendula*.

PLATE III.



INSECTS WHICH ATTACK WATTLE-TREES.

Fig. 14. Ialmenus ictinus, Hew.
15. ,, evagorus, Don.
16. Euchloris submissaria, Walk.
Fig. 17. Dactylopius albizziæ, Mask.
17a. ,, ,, Enlarged Female.
18. Lecanium buccatum, Mask.

The Green Looper Moth (Euchloris submissaria, *Walk.*).
(Plate III, fig. 16.)

When shaking foliage in the early summer, the larva of this handsome little moth is frequently tumbled into the umbrella. It is very easily bred in captivity.

The caterpillar is of the usual slender cylindrical form, of a dull buff or light brown tint, and is generally in a great hurry to crawl out of its unfamiliar surroundings. The larva readily pupates in a tin or jar, making no regular cocoon.

The moth is a beautiful delicate winged creature of a rich deep green colour, with the antennæ, front margin of the fore-wings, and outer edge of both pairs, stripe down the centre of thorax and body, and legs creamy buff to white. There is also a delicate indistinct wavy pattern across the centre of the wings. Length of outspread wings about 1½ inches across.

(III.) Diptera (Flies).

The Red Plush Gall (Cecidomyia sp. ?). (*Gall Fly.*)

This curious gall is formed upon the small twigs of this wattle, and single specimens are not uncommon in the inland districts; I have taken them about Wagga and Bathurst. I am not sure whether it is a gall gnat that produces it, as, like so many other galls, it is full of of inquilines and parasites, which are more readily bred from it than the rightful owner.

The gall grows to about the size of a nutmeg, is irregularly rounded, forming a central nucleus, like the sections of an orange, each containing several cells, the whole enveloped in a thick reddish-brown plush-like growth, which varies in colour from light brown to a rich red tint. It appears to be generally formed upon the flower stalks, aborting and absorbing them into its structure.

(IV.) Homoptera (Froghoppers).

The Green Frog-hopper (Sextius (centrotus) virescens, *Fairm.*).
[Fairmier, *Ann. Soc. Ent.*, *France*, IV.] (2nd Series.)

This is one of the commonest insects upon the young wattles, where they are much sought after by several species of ants that come to obtain the sugary secretion, popularly known as "honey dew," that they discharge from the abdominal glands.

The female slits the bark with her ovipositer and lays the eggs in rows, the young larvæ and pupæ as well as the perfect insects being found clustering along the branchlets, but as soon as disturbed they crawl round the twig away from their enemies, and when touched they spring from the hind legs and jump for a considerable distance.

It is of the usual wedge shape, broadest above the face, and tapering to a point at the tip of the wing, and its general colour is green shaded with yellow, the legs of the latter colour, and the under surface covered with floury secretion. The head is small, flattened in front

with large eyes on either side; the thoracic shield, forming an angular point on either side tipped with brown, turns over the back forming a slender curved keel, coming to a sabre-like point above the tip of the semi-opaque wings.

The Black Wattle Psylla (Psylla acaciæ-decurrentis, *Froggt.*).

[Froggatt, *Proc.*, *Linn. Soc.*, *N.S.W.*, 1901, p. 248.]

These dainty little insects sometimes smother the branchlets of this wattle with their eggs, larvæ, and pupæ, so that at first sight it looks as if the tree were infested with aphis. They form no lerp or covering, but lay the bright reddish-yellow eggs in regular rows round the twig; the young larvæ as they hatch out crawl lower down, and as they increase in numbers, the perfect insects and the others in all stages of development may be found on the same branch.

The larvæ are bright orange-yellow mottled with brown, flattened little creatures, which, when they reach the pupal moult, are of a bright reddish-brown colour, mottled with a darker tint, with little rounded wing pads on the sides of the thorax, short stout legs and broad flattened body, clothed with short spiny hairs.

The perfect insect is a delicate four-winged creature, with long slender antennæ and dark mottled brown wings; it measures about 2 lines in length, with head and thorax brown, and the abdomen banded with red and black.

I have collected it on wattles about the Wagga and Richmond districts.

The White Wax Psylla (Psylla candida, *Froggt.*).

[Froggatt, *Proc.*, *Linn. Soc.*, *N.S.W.*, 1901, p. 252.]

The larva of this insect, through feeding upon the extreme tips of the foliage, mat it together with a white waxy secretion, which draws the leaflets together and forms a shelter for the immature insects; sometimes all the tips of the foliage of a large bush are covered in this manner.

The tiny larvæ are yellow, of the usual flattened form, with broad wing pads, short stout legs, and somewhat elongate oval green abdomen.

The perfect insects leave the matted foliage tips and run about on the branchlets, but are never very numerous or clustered together in numbers like some of the other species. The little psylla measures 1½ line in length, is of a general dull yellow colour, with a bright green abdomen, and light brown wings.

It is common about Gosford and down the South Coast, but probably has a wide range.

(V.) Coccididal Scales.

The Camellia Scale (Aspidiotus camelliæ, *Sign.*).

[Signoret, *Ann. Soc.*, *France*, 1868, p. 117.]

This coccid is found upon a great number of different plants, and the tests of the female vary much in colouration and even shape on different trees. It is not uncommon on fruit trees—is found on a

number of ornamental shrubs, and has spread into several of our native shrubs; I have taken it upon *Acacia longifolia* at Kempsey, and upon *Acacia decurrens* at Mittagong.

Maskell points out that *Aspidiotus rapax*, Comstock, is a synonym of this species, as Signoret described it as far back as 1867, while Comstock named it in 1880; yet many writers still use the latter name.

This is one of the circular scales, generally of a dirty pale yellow tint, with the centre horn yellow to brown, and is scattered all over the bark of the branches, where they are rubbed off; a circular white mark generally shows where they have been attached to the bark.

The Snowy Scale (Dactylopius albizziæ, *Mask.*). (Plate III, fig. 17, 17a.)

[Maskell, *Trans. N.Z. Inst.*, 1891.]

This scale was described by Maskell from specimens sent him from Victoria upon the foliage of *Albizzia lophantha*, an introduced tree from Western Australia, but it is a very common wattle scale in this State, being found upon *Acacia discolor*, *A. Baileyana*, and about Gosford, smothering all the old black wattle trees, and apparently helping the other insect pests to kill them a little faster than usual.

The female coccid is under 2 lines in length, a little longer than broad, with the upper surface convex and the under-surface flattened; its outward colour is black; when crushed it gives a purplish stain. It forms no true test or scale, but all the under-surface is enveloped in white woolly secretion that folds round the outer edges, while two, and sometimes three, transverse bands of the same white substance cross over the dorsal surface, so that an infested tree looks as if the branches had been whitewashed.

The Berry Lecanium (Lecanium baccatum, *Mask.*). (Plate III, fig. 18.)

[Maskell, *Trans. N.Z. Inst.*, 1891, p. 20.]

This curious scale insect has a very wide range over Australia; is found on a number of different species of wattle in different parts of the country, and is common on the black wattles about Sydney.

When immature the scales are pale blue to creamy white in tint, and are attached all over the slender twigs; as they increase in size they come in contact and swell out into rounded shining brown sacs as big as a small pea, often encrusting the twig for several inches. This is the adult female scale; and, as she dries up, the tiny larvæ crawl from beneath the sheltering cover of the mother and attach themselves to the bark, where they become a fixture.

White Wattle-bark Scale (Fiorinia acaciæ, *Mask.*).

[Maskell, *Trans. N.Z. Inst.*, 1881.]

This coccid belongs to a genus that Maskell says "has hitherto been reported in the open air from New Zealand and Australia. It exists in hot-houses in Europe and North America." Nine species are recorded in his list, found upon all kinds of trees, and this one has a very wide range in Australia, and is found upon at least half-a-dozen

species of Acacias. It is a pretty little scale, the base forming a black rounded raised spot, from which falls an elongate white scale fluted or divided down the centre; they are closely attached to the bark, forming little white dots over both the trunk and foliage, and I have frequently had it pointed out to me by orchardists as the white louse of Orange (*Chionaspis citricola*), which it resembles only in its bright white colour.

Green Wattle Coccid (Rhizococcus viridis, *Green*).

[Green, *Proc. Linn. Soc*, *N.S.W.*, 1891, p. 559.]

This is an oblong, oval, naked coccid of dull green colour when alive, but as it dries it changes to a dark purplish-brown. It is very convex above with deep corrugations, and the under-surface somewhat flattened, legs and antennæ short. The insect forms no scale or covering, simply clinging to the small twigs or mid-rib of the leaves. It is a very rare species. I have only found it infesting one wattle at Mittagong, and have seen it nowhere else; it was described from specimens sent by Mr. E. E. Green.

The Fluted, or Cottony Cushion Scale (Icerya Purchasi, *Mask.*).

[Maskell, *Trans. N.Z. Inst.*, 1878.]

This scale has a world-wide reputation on account of its wonderful spread over New Zealand, Africa, and America, where it attacked and almost destroyed the orange groves. It is said to have been introduced into America about the year 1868 on *Acacia latifolia* from Australia, but, until Maskell described it as new, was supposed to be identical with a species *Icerya sacchari*, Guerin, which came from the islands of Mauritius and Bourbon, where it infested the sugar-cane.

Riley came to the conclusion in 1888 that the Fluted Scale was a native of Australia, and I think that there cannot be the least doubt about it, for it is common in the bush in many parts of Australia, nearly always confining itself to some species of wattle; though when roses are growing in a garden where wattles are cultivated it generally also infests them. Maskell gives a long list of very dissimilar trees upon which it is found in New Zealand, but, with the exception of wattles, orange trees, and rose bushes, it is rather limited in its spread. Though so destructive to vegetation in countries into which it has been introduced, it is not a pest, in the strict sense of the word, in New South Wales, simply because it has so many parasites that feed upon it both in the larval and mature state that it never has a chance to increase to any alarming extent.

It is common on *Acacia decurrens* about Sydney and Mittagong, but attacks nearly all species when cultivated in gardens.

When adult, the coccid, clothed in her curiously fluted or ribbed cotton, which forms a wonderful protection for the eggs as they are deposited, measures 6 lines in length, and is very easily recognised, as there is no other scale insect like her.

A GREY GUM.
(EUCALYPTUS PUNCTATA, DC.)

Useful Australian Plants.

BY J. H. MAIDEN,
Government Botanist and Director of the Botanic Gardens, Sydney.

No. 79.—A GREY GUM (*Eucalyptus punctata*, DC.).

THIS is a grey gum of the coast and coast range districts which was described by De Candolle from specimens in bud many years ago. As a species it has had many vicissitudes; finally Baron von Mueller, on the recommendation of Dr. Woolls, established it again as a species in his "Eucalyptographia." Following is Mueller's description of it:—

Branchlets robust and very angular.

Leaves scattered, elongate or sickle-shaped, lanceolar, of thin consistence, beneath slightly paler and there not shining; the lateral veins numerous, very subtle and much spreading, the circumferential vein close to the edge; oil-dots numerous, imperfectly transparent; umbels axillary and solitary, or at the summit of the branchlets paniculated; their stalks broad and strongly compressed, bearing generally from three to ten flowers

Tube of the calyx almost semiovate or nearly hemispherical, merging gradually into an angular rather thick stalklet of about the same or greater or lesser length.

Lid semiovate-conical, as long as the tube or somewhat longer.

Stamens all fertile, inflexed before expansion; anthers almost oblong, but upwards broader, opening with longitudinal parallel slits.

Stigma not or hardly broader than the style.

Fruit nearly semiovate, three, or oftener four, rarely five-celled, not large nor angular, rim finally rather broadish, flat or convex: valves short, deltoid, at last exserted or convergent from the rim.

E. punctata has some large fruited forms which have been named variety *grandiflora*. Following is an account of them. Their real difference from the type appears to be only in the fruits.

1. Leaves punctate. Buds all ovoid. Double operculum. Rim at junction of calyx and operculum very sharp. The calyx-tube usually angled. Fruits 7 to 8 lines in diameter; valves usually not much exserted. We have an intermediate form (from Wyee) with valves well exserted.

2. Shape hemispherical, or nearly so, to conoid. Rather broad rim. Bark and timber not to be distinguished from that of normal *punctata*.

This large fruited form is well marked, and well worthy of being a named variety. As in *resinifera* (Forest Mahogany), so in *punctata*, there is no line of demarcation between the normal and *grandiflora* forms, the transition being gradual.

Comparing this with the normal or small fruited form, Mr. Augustus Rudder, a forester of considerable experience, writes in the *Agricultural Gazette*:—"This is one of two trees with the same vernacular (Grey Gum). In general appearance, to the casual observer, the trees are much alike, but the leaves of this are rather broader, and its fruits and blossoms are very much larger than those of the other variety. The trees generally are not so large, and are more limited

in range of habitat, and, as a rule, do not approach so near to the coast, though I have seen it at Raymond Terrace; and near the beach at Charlotte Bay and Wallis Lake, in this district, the two trees often grow together. I have mostly observed it on the lower ranges in the counties of Gloucester and Durham. The timber is red in colour, is hard, and very lasting, and is well suited in the round, for heavy timbers in bridges and culverts."

I have collected it within the range stated. Hitherto this form has only been found north of Port Jackson.

This tree has been frequently confused with the *grandiflora* form of *E. resinifera*, where herbarium specimens only are available; in the forest the two trees could not be confused for a moment, their bark immediately distinguishing them.

Reverting to the normal form, the smooth bark is often of a yellow ochre or pale brown colour, and hence might be called "Brown-barked Gum." It is sometimes known in the Mudgee district as "Slaty Gum" as well as "Black Box," both descriptive names for certain trees. The buds also are very different, those of the variety of *punctata* being ovoid,* and the rim very sharp, with frequently a double operculum, while that of the variety of *resinifera* is conical and even rostrate.

The fruits of the variety of *resinifera* have the valves more exserted, and they sometimes have a tendency to be conical.

Bark.—The tree is called Grey gum because of the dull grey appearance of the bark, which has a roughish appearance, in contradistinction to a smooth and even shiny one, possessed by so many of our gums. It has smooth white patches in places, caused by the outer layers falling off. These white patches in their turn become grey, and the process of exfoliation of the bark is repeated until probably the whole of it on the trunk is shed at one time or another. Although rather difficult to properly describe, the bark of the Grey gum is so characteristic, that when once pointed out, it could not be confused with the bark of any other hardwood tree.

Timber.—Grey gum is so much like Ironbark in appearance, that it is difficult to discriminate between the two timbers. That will be the best guide to its appearance. An expert would usually detect the substitution for Ironbark (if he suspected any substitution), by noting that a chip of Grey gum is more brittle than that of Ironbark. It also cuts less horny. Nevertheless, the two timbers are wonderfully alike, and for many purposes Grey gum is an efficient substitute for Ironbark, for it is remarkably durable. Its inferior strength, as compared with the latter, precludes its use as girders of any length, and when substituted for Ironbark in sleepers, the bolts and spikes work loose in them. I would encourage its use in every possible way for wood-blocks. The chief objectors to its use at the present time are the saw-millers themselves, as the logs often contain gum-scabs or gum-veins. At present, where unblemished timber is insisted upon for wood-blocks, a saw-miller cannot afford to cut up Grey gum

* The bud reminds one exactly of an egg in an egg-cup.

DIPLACHNE LOLIIFORMIS, F.v.M.

(although it frequently turns out unblemished), because of the risk of having it condemned. I have spoken on this subject on other occasions, and would emphasise the opinion that wood-blocks should not be condemned because they contain a few gum-scabs or veins. Such excess of care practically leads to great waste of really valuable timber.

Grey gum is recommended for paving-blocks, as already stated. It is in high repute for posts, having excellent records when employed in this very trying situation. I have seen it used for felloes and for shingles. It is very largely used as an Ironbark substitute for railway sleepers, &c., which fact, in itself, is testimony to its excellence.

Its timber is similar to and apparently identical with the common Grey gum of the North Coast districts, viz., *E. propinqua*, Deane and Maiden.

Range.—It belongs to the coast district and coastal mountain ranges as already stated. Its most southern recorded locality appears to be Milton; its most northern, Lismore; and its most western, Capertee, on the Mudgee line. I should be glad of records beyond these ranges.

REFERENCE TO PLATE.

A. Sucker leaf.
B. Fruits, reduced in size.
C. A fruit, natural size. Fruits of this species are sometimes much larger, as explained in the text.

No. 80.—*Diplachne loliiformis*, F.v.M.

Botanical name.—*Diplachne*, Greek, *diplous*, two-fold or double, *achne*, chaff (glume), the flowering glume being two-lobed; *loliiformis*, Latin, having the general appearance of the grasses belonging to the genus *Lolium*.

Botanical description (B.Fl., vii, 618).—A slender apparently annual erect grass, usually 6 to 8 inches, but a few specimens above 1 foot high.

Leaves chiefly at the base, short and narrow, usually sprinkled with a few long hairs, the sheaths ciliate at the orifice, with a short-jagged ligula.

Spike slender and simple, 2 to 4 inches long, on a long peduncle.

Spikelets sessile, rather distant, erect and appressed, turned somewhat to one side, narrow, 3 to 4 lines long, 6 to 12 flowered, the rhachis hairy round the flowering glumes.

Flowering glumes about 1 line long, glabrous, three-nerved, the central nerve produced into a fine point or awn shortly exceeding the hyaline lobes.

Value as a fodder.—Quite a small grass, eaten by sheep, but not of special value for forage.

Habitat and range.—Found in all the States except Tasmania and Western Australia. While most commonly an interior species, it also occurs in New England, according to specimens received from Mr. J. F. Campbell; found also in Asia.

REFERENCE TO PLATE.

A. Portion of panicle.
B. Portion of a spike showing four spikelets.
C. A single spikelet, with flowering glume and palea.
D. Grain.

A New Edible Tuber

(*Coleus Coppini*).

By EDWARD HECKEL.

A GOOD deal has been written lately on the *Ousounifing* and its tubers, the use and cultivation of which are steadily increasing in the French tropical colonies. It has been incorrectly called *Plectranthus Coppini*; but, judging by the structure of its stamen, it is really a *Coleus*. Being a new species, it is as well, therefore, to give it definitely the name of *Coleus Coppini*.

Some deficiency still exists in the history and knowledge of this plant and its tubers, particularly as regards the chemical analysis of the latter.

I have thought that it might be of interest to give the results of the researches made by my friend Professor Schlagdenhauffen, of Nancy, at my request, using the tubers from the last crop, of November, 1901, raised in the Colonial Botanical Garden at Marseilles. It is a very remarkable fact that this Soudanese plant will pass through all its stages of development in our short summer season of about four months.

From this fact, and also because it has not a name indigenous to the Soudan, I am persuaded that it originates in Abyssinia, like a great many more edible tubers belonging to the same class *Coleus*. Besides this, it resists very well the cold of the early part of November, and the first tubers introduced from the Soudan flowered early in October in Marseilles in the open air, producing fine heads of blue flowers, which only the cold of the end of November withered before they had turned into fruit; but each year I have obtained from eighteen to twenty stems, six to seven tubers per stem. These were heavier and larger in 1901 than in 1900. It would thus appear that cultivation favours the improvement and development of these tubers, and I intend to continue my experiment with the view of cultivating the plant in the southern districts of France. Another reason for this is that the results of the chemical analyses and culinary uses made by Professor Schlagdenhauffen of the tuber encourage its introduction as human food—for cultivation, at any rate, in our southern districts.

We shall see from the analysis that the tuber contains fatty substances, is rich in starch, glucose, and saccharose. It certainly contains but little albuminous matter, but is, nevertheless, a perfect food.

Its taste, when cooked, is very agreeable, resembling that of Japan Crosue, or salsify, while it is richer in alimentary equivalents than either of these legumes.

In a somewhat dry lot of thirty tubers were found five or six weighing 0·015 lb.; eight about 0·012 lb.; three to two 0·007 lb.; and the remainder about 0·005 lb. (This would amount to, say, 66 to 250 to the pound.)

The largest were $1\frac{5}{8}$ inch long by $\frac{5}{8}$ inch thick, the average were between $\frac{13}{16}$ inch long by $\frac{1}{2}$ inch thick, and the smallest were $\frac{1}{2}$ inch long by $\frac{1}{4}$ inch thick.

In a fresh state they contain nearly 80 per cent. of water. They dry very quickly and after being exposed to the air for some days, they shrivel, and only show about 75 per cent of moisture.

When the dark brown or black skin is removed, they are white at first, but darken in a few moments; moreover, the knife used turns black, which is an evident proof of the presence of a good deal of tannin, not only in the skin, but also in the body of the tuber. This, when stripped of its skin, and thoroughly dried, has the appearance of a chocolate-coloured and very hard subtance, which can be reduced to a fine powder by a pestle. This powder is submitted to the action of ether, of petrole, chloroform, alcohol, and water, then the residue is calcined to ascertain the weight of the ashes, and the percentage of cellulose and ligneous matter can then be calculated.

Successive analyses gave the following results as to the composition of these tubers.

Fatty matter	2·50	per cent.
Glucose	10·68	
Saccharine	1·67	
Not defined	4·35	
Gum and pectic matter	16·05	
Albuminous substances	5·78	
Starch	14·00	
Ashes	4·26	,,
Cellulose, ligneous matter and loss	40·71	,,
	100·00	,,

The ashes consist of sulphates, phosphates, and carbonates.

The weight of the potash is 2·49 per cent., and of the soda, 1·34 per cent.

Culinary Use.

These tubers, as is well-known, replace in French tropical colonies the potato, which does not produce any tubers, but grows all into leaf. In the Soudan they are very much appreciated, even by Europeans. When the tubers are scraped in the fresh state, their odour is very much like that of potatoes. A very simple way of cooking them is to immerse them in nearly boiling water for twenty minutes, when the black skin can be easily removed, and the fleshy part which remains is white. Add a little chopped parsley, butter and seasoning, and serve hot.

Prepared thus, they have a most agreeable taste, resembling that of Crosue of Japan, or salsify.

This appears to be a plant worthy of trial in New South Wales. As M. Heckel points out, it is probable that with cultivation the tubers may be greatly increased in size. In some of the arid western districts potatoes can only be grown with difficulty, and this tuber may in time prove a good substitute for them. As a crop for pigs there should also be a future for it.

The Necessity of Cleanliness in Poultry-yards.

ROBT. A. M. SOLOMON.

How often do we hear that poultry-farming does not pay. No; poultry-farming does not pay, as carried on by most people.

It is essentially a business of detail, the neglect of seemingly trivial things often causing such loss as will spell ruin; then the poultry-farmer says it does not pay, and sells his very likely diseased stock to the first novice he meets, thus spreading disease from yard to yard. The business of poultry-farming is one that requires unceasing watchfulness, observation, and economy of management.

In how many yards is roup prevalent; yet it is a disease which the poultry-farmer should never see, as it is the result of sheer neglect of the first principle of poultry-farming—cleanliness. If birds are bred from healthy stock, have water-tight damp-proof houses, kept well whitewashed and scrupulously clean, there would be no roup to harass and disgust the poultry-farmer.

How often are the drinking fountains thick with slime and exposed to our semi-tropical sun, with the result of bowel troubles, and consequently death.

I was looking over a farm a few weeks back kept by a man who considers himself an expert (by the way, he had young pullets running with old hens), but complained that his fowls were not laying, nor were they healthy. Yet his feeding was correct, the houses were water-tight, and, from a few yards away, looked spotless. On examining the woodwork and perches closely, I found them absolutely red with lice swarming in every crack and cranny, which, no doubt, largely accounted for the complaint made to me; yet a few hours' work with kerosene and a brush would have remedied that evil.

I believe that poultry-farming can be made as remunerative as any other form of business, but it can only be made so by one who thoroughly understands what he is doing, and who does it with all his might. Leave nothing to others, superintend every detail yourself, and you will be rewarded by seeing bright, active, contented fowls, and, above all, fowls that will lay. See that the egg-boxes are free from vermin; never have them with a wooden floor and straw, but resting on the bare earth.

If fowls are yarded, let the soil be turned over occasionally; do not spare whitewash on the houses, nor kerosene on the perches; wash drinking fountains every day, and keep them in the shade. Separate at once any bird looking at all sick, and burn any that die from disease.

What I have written will, to many, seem quite unnecessary; yet, from my own knowledge, there are hundreds who keep poultry, and who do not realise how vital is absolute cleanliness to the success of this business; and, if these few hints are followed, I feel sure that we shall hear less of whole yards being destroyed by roup and kindred diseases.

Note on the Effect of Manuring upon the Milling Quality of the Grain.

F. B. GUTHRIE AND G. W. NORRIS.

THE following description of the general characteristics of the grain obtained from some of the manure-experiment plots harvested during the past two years at Bathurst and Wagga may serve as a preliminary note on the effect of different classes of manures upon the grain, with special reference to the flour obtained from it.

The wheats referred to as being harvested in 1901 at Bathurst and Wagga are from the plots described in the *Agricultural Gazette*, April, 1901. The 1902 experiments will be found described in the *Gazette* for June, 1902.

The manuring of the different plots from which the samples were taken was as follows:—

Plot No.	1.—No manure.		
,, ,,	2.—Sulphate of ammonia	70	lb. per acre.
,, ,,	3.—Superphosphate	300	,,
,, ,,	4.—Sulphate of potash	40	,,
,, ,,	5. { Sulphate of ammonia	70	,,
	Superphosphate	300	,,
,, ,,	6. { Sulphate of ammonia	70	,,
	Sulphate of potash	40	,,
,, ,,	7. { Superphosphate	300	,,
	Sulphate of potash	40	,,
,, ,,	8. { Sulphate of ammonia	70	,,
	Superphosphate	300	,,
	Sulphate of potash	40	,,
,, ,,	17. { Dried blood	120	,,
	Superphosphate	300	,,
	Sulphate of potash	40	,,
,, ,,	19. { Nitrate of soda	100	,,
	Superphosphate	300	,,
	Sulphate of potash	40	,,
,, ,,	34. { Sulphate of ammonia	140	,,
	Superphosphate	300	,,
	Sulphate of potash	40	,,
,, ,,	46. { Nitrate of soda	200	,,
	Superphosphate	300	,,
	Sulphate of potash	40	,,

WHEATS from Manure Plots, Bathurst—Harvest of 1901.

No. of Plot.	Strength.	Gluten.	Percentage of Mill Products.		
			Flour.	Pollard.	Bran.
No. 1	45·2	11·80	73·9	10·4	15·7
,, 2	48·0	11·21	75·8	11·8	12·4
,, 3	46·4	12·01	73·5	12·6	13·9
,, 4	45·6	11·29	69·5	13·1	17·5
,, 8	48·0	12·05	74·0	11·7	14·3
,, 17	47·2	11·66	72·1	14·5	13·4
,, 19	48·0	12·61	74·9	10·7	14·4
,, 34	48·4	12·86	71·9	13·2	14·9

WHEATS from Manure Plots, Wagga—Harvest of 1901.

No. of Plot.	Strength.	Gluten.	Percentage of Mill Products.		
			Flour.	Pollard.	Bran.
No. 1	45·5	11·99	72·2	13·3	14·5
,, 2	45·2	10·43	70·2	12·4	17·4
,, 3	45·8	12·06	72·9	10·9	16·2
,, 4	45·0	12·02	72·9	9·8	17·3
,, 8	48·0	11·70	72·2	10·3	17·5
,, 17	49·2	10·46	70·5	18·2	11·3
,, 19	48·0	12·91	73·2	15·8	11·0
,, 34	49·2	11·82	71·3	10·8	17·9
,, 46	48·0	13·30	73·6	12·1	14·3

WHEATS from Manure Plots, Wagga—Harvest of 1902.

From Plot—	Strength	Gluten.	Percentage of Mill Products.			Character of Gluten.
			Flour.	Bran.	Pollard.	
No. 1 ...	53	9·8	74·6	13·2	12·2	Yellow, brittle, elastic, non-coherent and non-adhesive.
,, 2 ...	50·4	8·7	71·6	14·8	13·6	Yellow, coherent, elastic, non-adhesive.
,, 3 ...	50	11·4	70·6	17·8	11·6	,, ,,
,, 4 ...	52	10	73·7	13·1	13·2	,, ,,
,, 5 ...	52·4	11·6	68·2	19·2	12·6	,, ,,
,, 6 ...	50	8·8	70·5	20·0	9·5	,, ,,
,, 7 ...	53·8	10·7	70·9	17·8	11·3	Yellow, non-coherent, brittle, elastic.
,, 8 ...	53·8	12·0	72·5	14·6	12·9	Yellow, coherent, elastic, slightly adhesive.

It was found in the Wagga plots that those to which superphosphate had been added either alone or in combination with other manures yielded invariably a larger amount of grain. It does not, however, appear to have affected the milling quality of the grain to any appreciable extent.

It is in the plots treated with different kinds of nitrogenous manures that one would expect to find the most striking differences in the gluten content and strength of the flours produced.

In the Wagga results, 1901, the effect of the ordinary dressing of sulphate of ammonia alone appears to be almost nil, both upon the gluten content and the strength (plot 2). When this is combined with superphosphate and potash salts, however, the benefit both in strength and gluten content is marked (plot 8), and the effect of increasing the sulphate of ammonia is very marked (plot 34). Dressing with nitrate of soda instead of sulphate of ammonia (19 and 46) does not appear to be very beneficial to the strength of the flour, but increases considerably the content of gluten.

In the 1902 harvest, Wagga, the same condition of things is noticeable in the plots which have been there examined. The plot which received the complete manuring shows the best results in gluten content and strength, the nitrogenous dressing alone in the form of sulphate of ammonia showing no benefit. This manure has also no effect upon the yield (see report in *Agricultural Gazette* for April, 1901), and it appears that the soil on the farm at Wagga does not respond to this form of fertiliser.

Dried blood, though apparently without action on the gluten content, increases the strength of the flour in a striking manner. (No. 17, Wagga, 1901.)

At Bathurst, on the other hand, where nitrogenous manuring had been found to directly increase the yield, the results show that it has an appreciable and favourable effect upon the gluten. Plot 2, treated with sulphate of ammonia only, produced a grain, the flour from which is markedly stronger than from those plots, 1, 3, 4, from which nitrogenous manuring was absent.

The highest gluten content is obtained from complete manures, and the effect of doubling the nitrogenous dressing in these cases is to increase both strength and gluten content (34).

These notes are of a preliminary nature, and the results are to be received with caution. It was not found possible to examine all the plots which it was originally intended to include in the investigation; and the imperfect condition of the ground, and the lateness of the sowing, as well as the exceptionally dry condition under which the crops were grown, affect the nature of the grain to an even greater extent than the yield.

It is, however, considered desirable to place them on record for future guidance, and as indications of the probable direction in which the milling qualities of the grain are affected by manuring.

Next year a much larger number of plots will, it is hoped, be examined, and with every succeeding year, as the conditions under which the crop is grown become more constant, the results will be correspondingly more exact and reliable.

The Cultivation of Beet for Forage.

By M. DEHÉRAIN
(in the *Journal de L'Agriculture*).

It has been my endeavour for many years to persuade the farmers to change their mode of growing beet for fodder. They merely take the trouble to obtain the maximum crop per acre, without taking into consideration the quality of the roots.

They choose only the large species, which yield a heavy-weight crop, and have compelled the producers of seed to supply this kind; and this tendency has actually created the name of the beet mostly used, that is, the Mammoth.

In order to obtain the maximum weight per acre strong fertilisers are used, and the plants are spaced from 20 to 24 inches each way. Under these conditions a crop of enormous sized roots is obtained, weighing 7, 9, 11 lb. each and even more; but these roots, besides being often hollow, are very moist, and consequently do not contain much nutritive matter.

If, on the contrary, the space is diminished, they grow of a smaller size, but the quality improves, and they are less watery and contain a larger percentage of nutritive matter.

As an example, I give below the result of analysing two Mammoth beets:—

Weight...	18¼ lb.	1½ lb.
Dry matter, per cent.... ...	8·5	16·5
Sugar, ,, ...	6·2	11·1
Azotic matter, ,, ...	1·7	1·03
Nitrate of potash, ,, ...	0·17	0·08

The large root was dug out whole, but showed several hollow parts; it grew by itself and contained 91·5 per cent. of moisture. When such large roots as this are cut, the water drops from all parts. We may state also that these large beets contain a good deal of saltpetre, which does the animals harm when passing through the organism. Then it passes into the manure where it decomposes, and thus the most valuable of fertilising matters are lost. In order to obtain good roots with a small percentage of saltpetre and rich in dry matter, it is necessary to plant in rows 16 inches apart, and 10 inches apart in the rows, when we obtain roots weighing about 2¼ lb., which certainly gives a smaller total weight per acre than those planted further apart, but always more dry matter and sugar, and less saltpetre. In 1891 I planted two

varieties of beet (the Mammoth and the Globe) with large and small spaces and obtained the following crops:—

	"Mammoth."		"Globe," with small leaves.	
Spaced inches..	16 x 16.	14 x 10.	16 x 16.	14 x 10.
	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.
Crop per acre	34 $3\frac{1}{2}$	32 16	35 0	34 $6\frac{1}{2}$
Dry matter	4 12	5 8	4 9	5 3
Sugar	2 10	3 13	3 3	3 16
Azotes	0 $4\frac{3}{5}$	0 $6\frac{3}{4}$	0 6	0 $5\frac{3}{5}$
Nitrate of potash	0 $1\frac{3}{4}$	0 $0\frac{1}{2}$	0 $1\frac{3}{5}$	0 $0\frac{1}{4}$

The following years I obtained similar results, and several agriculturists who were interested in the matter repeated the experiments.

M. Berthold, my colleague at the Grignon College, and M. Garola, Professor of the Department of Agriculture of Eure and Loire, both acknowledge that the small space was advantageous. The first point being proved, it remained to discover which variety was most suitable.

Beet with the best reputation has been selected to obtain large dimensions. This abnormal size disappeared by closer planting; consequently it was not advisable to use these varieties, and others containing more sugar were tried. My experiments becoming known, the producers of seed took up the work, and soon offered to the growers, in place of the large-sized ones, other varieties called *demi-sucrière* (half-sugar), larger than the sugar beet, but generally incapable of attaining the enormous dimensions of the forage beets. I experimented with two of these varieties in 1898, and they gave very good results. Having fixed on the best manner of cultivating, and on the best variety to sow, I considered the time had come to set in motion the reform which I had foreseen for several years.

A powerful central syndicate of agriculturists was formed in France, and offered me the means. The board of directors instructed me, several years ago, to make out a programme of experiments, which they requested their members to carry out.

The latter, animated by the desire to be useful in contributing their part in spreading the better methods of cultivation, have willingly undertaken these experiments, for which every praise is due to them. In the spring of 1900 sufficient seed for 240 square yards was dispatched to the cultivators, of the variety known as Half-sugar Rose. These were sown in rows 16 inches apart, with the roots 10 inches apart in the rows, to be grown in competition with a foreign beet, chosen by the experimentalist, but maintaining the large space of 20 x 20 inches.

With these was forwarded a paper, the details of which were to be filled in by the cultivator, such as the nature of the soil, the manure used, and the character of the season.

At the time of gathering, the beets were to be weighed separately (as regards species), then from a lot of 100 roots taken haphazard from each variety were to be picked the large, medium, and small.

The relative proportions of each were to be entered on the paper sent, and, finally, a sample of each size of the two varieties was to be

sent to the laboratory. By analysing these roots, having the total number and weight obtained, the composition of the crop may be calculated.

The experiments made in 1900 were very numerous; but owing to a bad season the results were not satisfactory. We, however, give the averages :—

	Forage Beet, with large spaces.		Half-sugar Beet, closely planted.	
	Tons.	cwt.	Tons.	cwt.
Crop (in tons) per acre	16	0	18	7
Dry matter	1	17½	2	15
Sugar	1	7½	2	4

The season was dry and the crops light; but they still showed the advantages derived from close planting. In 1901, the experiments were more successful, and the following are the averages :—

	Forage Beet, with large spaces.		Half-sugar Beet, closely planted.	
	Tons.	cwt.	Tons.	cwt.
Crop (in tons) per acre	21	14	19	2
Dry matter	2	4	2	11
Sugar	1	6	1	12½

The manifest result of the preceding averages, obtained from experiments made in various districts of France, is to show distinctly the advantages of close planting for forage beets. More dry matter is obtained and more sugar than from those in larger spaces. The analysis has also gone further, and has shown less nitrates in the close-planted than in the large-spaced ones. Some of the experimentalists in 1901 have found that in the same space the forage beets have a slight advantage over the half-sugar ones, the first having given, as an average of six crops, 6 tons 1 cwt. of dry matter, against 5 tons 16 cwt. from the latter.

I myself studied this subject in 1900 and 1901, and my experience was distinctly in favour of the half-sugar ones.

The advantages of close planting are not only shown by this analysis, but also by the experiences in fattening cattle, the half-sugar ones planted closely having turned out very much superior in that respect. If this new manner of cultivating beet intended for cattle is adopted, it will prove much more remunerative, as can be easily calculated—in fact, 2½ acres of large roots with wide spaces are worth only £28, whilst the value of the close-planted ones amounts to £36. If this gain of £8 is realised on the 1,000,000 acres which, in France, is devoted each year to this culture, it will produce an extra profit of £3,200,000.

[Sugar beet seed of excellent varieties may be obtained from Sydney seedsmen at about 1s. 6d. per lb. From 16 to 20 lb. of seed per acre is found to be ample for dense sowing. In September is the best time to plant.]

Pruning.

(Continued from page 676.)

W. J. ALLEN.

The Apricot.

This tree, from its infancy, until it attains the age of five years, usually makes a most vigorous growth, and in consequence requires considerable guiding and trimming in the summer as well as the ordinary winter's pruning. If such attention is not given, the limbs are apt to spread out in every direction, will be willowy and weak, and will, when laden with fruit, and exposed to high winds, be so damaged, if not utterly spoilt, that at least two seasons would elapse before the tree could recover its former shape. Therefore, I would recommend most careful attention in its pruning; see that it has strong branches, a well-balanced, symmetrical low head, the branches free from forks, and each with a separate hold of the trunk or main arms.

All good varieties of apricots will, with proper winter and summer pruning, throw out small fruit spurs from the branches where it is very desirable to have them, and where the bulk of the fruit should be borne. When the fruit is well distributed over the whole tree it can, with ease, carry a full crop of fruit, where an unpruned, or badly pruned tree would, with such a weight break, or be so badly bent, that both tree and fruit would, in all probability, be badly damaged by the sun. In California, where I have grown and handled hundreds of tons of this fruit, I have picked up to 600 lb. of fruit from a single tree, all of which were of good marketable size; and from well-cared-for trees I have picked at the rate of 10 tons to the acre from 40 acres in one season.

After the trees have attained an age of about eight years, it will be found that they will require but light pruning as compared with what has been found necessary during the first few years after planting, as at this age (eight years) they should produce regular crops every year, and while they develop sufficient new wood to ensure a crop of fruit for the following year, there is very little of that strong growth which is found on the younger trees. The fruit spurs and shoots will require thinning out and shortening back.

If trees of any variety are only bearing every other year, it is best to prune them rather severely the winter before the heavy crop is expected; if still too much fruit sets, then thin liberally during the summer; and if the trees put on a good growth, summer prune in January;—then only a very light pruning will be required the following winter. If this treatment fails to regulate the cropping, and does not ensure more even crops one year with another, then the only

conclusion which a reasonable mind can come to is that the variety is at fault, and that it will be well to replant or graft to one of the many good varieties which can now be procured, and which will, with ordinary treatment, crop every year.

The apricot bears its fruit on one-year old wood, and spurs two years or more old. I occasionally see orchards where the pruner, with more zeal than wisdom, has cut out all the inside spurs and fruiting wood from the tree, and an inquiry as to why the best of the fruiting wood had been cut away has elicited the reply that it was thought that the centres of the trees should be kept entirely open, or that some old experienced pruner had told them to clean this wood out as it would not bear good fruit. I can only say that had such pruners engaged in some other occupation, rather than fruit-growing, it would have been a distinct gain to the country, for they have put many a young fruit-grower on the wrong tack, and in this manner have succeeded in doing more harm than can be recouped in years, as no

Fig. 19.

Fig. 20.

greater mistake could be made than the removal of such spurs which usually bear some of the very best fruit without laying any great strain on the tree, as that particular part of the tree could more easily carry a hundred-weight of fruit than half that quantity could be carried out on the ends of the branches, and with less liability of its being spoilt by being beaten around by the winds and exposed to the sun, as is the case with fruit at the ends of branches. Therefore, the grower who divests his trees of this wood is only robbing himself.

At times it is found necessary to cut off good-sized limbs. This can be done without much danger of damaging the tree if the cut is made as close as possible to the main branch or trunk from which it is being removed. For example the three following cuts, as shown in figs.

19, 20 and 21 were made at the same time, but at different distances from the main branch. It will be seen that 19, which was cut closest to the branch, is nearly healed over; 20 has made a fair start; and 21, which was cut off two or three inches from the tree has not started to heal but to decay, and in consequence it will only be a matter of very little time before the centre of the limb becomes rotten, and will, in all probability, have to be removed, if, indeed, the wind does not perform that operation. I might mention that none of these wounds were dressed at any time, but were left as an experiment, to see how they would heal without treatment. It is always advisable, however, to paint all wounds over with white-lead, which preserves the cut from decay, while the tissue is forming over the wound.

Bailey, in his "Cyclopaedia of American Horticulture," says:—"The wound made by severing a branch heals by means of a callus which forms from the growing tissues between the bark and wood. This tissue rolls over the wound, finally joining in the centre, and completely covering the old wood. The old wood itself takes no part in the healing process—in fact, it dies. When the healing is complete, the old wood is merely covered and preserved from external injury and infection, much as fruit in a jar is preserved by being protected with a cover. There is no dressing that will hasten the healing process except as it keeps the wood from decay; in other words, the whole object of dressing a wound is to protect it. The dressing prevents bacteria and fungi from securing a foothold, and thereby prevents the rot. Wounds that are exposed for some years nearly always become unsound at the centre because of the intrusion of these organisms, and even if the wounds should subsequently heal over, the infection may still extend down the heart of the tree and finally cause its death. The best covering for a wound is one that protects it best from microbes and fungi and which persists the longest. Ordinarily, good white-lead paint, applied heavily and renewed occasionally, is the best protection. Grafting wax may afford a good protection if it is applied hot so that it soaks into the tissue. If it is merely spread over the surface it soon blisters and becomes loose and affords relatively little protection. The rapidity with which wounds heal depends very largely upon their position in the tree and the way in which they are made. Wounds along the main branches, which are the leading avenues for distribution of food, heal more speedily than those on the weaker side branches. The closer the wound sits to the branch the more quickly will it heal. If a stub is left several inches long it seldom heals until it rots back to the main branch or trunk, and by that time the decayed

Fig. 21.

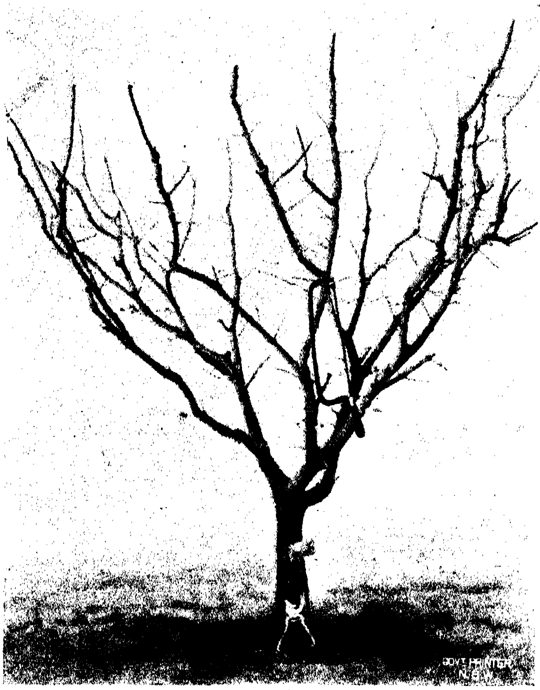


Fig. 22.

heart may have extended deep into the tissue of the tree. It is a common notion that a limb should be cut at right-angles to the direction of the limb itself and beyond the bulge at its base. It is a better plan, however, to make the wound parallel to the direction of the branch or trunk that remains, and close to it. This wound may have a somewhat larger superficial area, but it is much nearer the source of the healing food supply, and therefore becomes covered more quickly."


Fig. 23.

The following are illustrations of pruning as practised at the Departmental orchards:—

Fig. 22.—Four-year old apricot tree, pruned after the manner described.

Fig. 23.—A tree in full bloom, showing flowers from trunk to extreme points of laterals and shoots.

Fig. 24.

Fig. 24.—The same tree, taken from another position, showing the whole tree bursting into leaf after the fruit has set; the latter, however, in this illustration cannot be seen plainly without the use of a microscope, when fruit can be observed all through the tree.

Fig. 25.—Showing fruit set on trees pruned after this system. It will be seen that fruit is borne on short spurs and shoots along main arms and branches, beginning from the trunk of the tree. This photo. was taken as soon as the fruit was set and before the tree was covered in foliage. It serves to show theory put into practice.

Fig. 25.

Fig. 26.

Old tree, 25 feet high, which had been allowed to lose all its centre shoots and spurs, showing growth forced into centre of tree after one severe winter pruning.

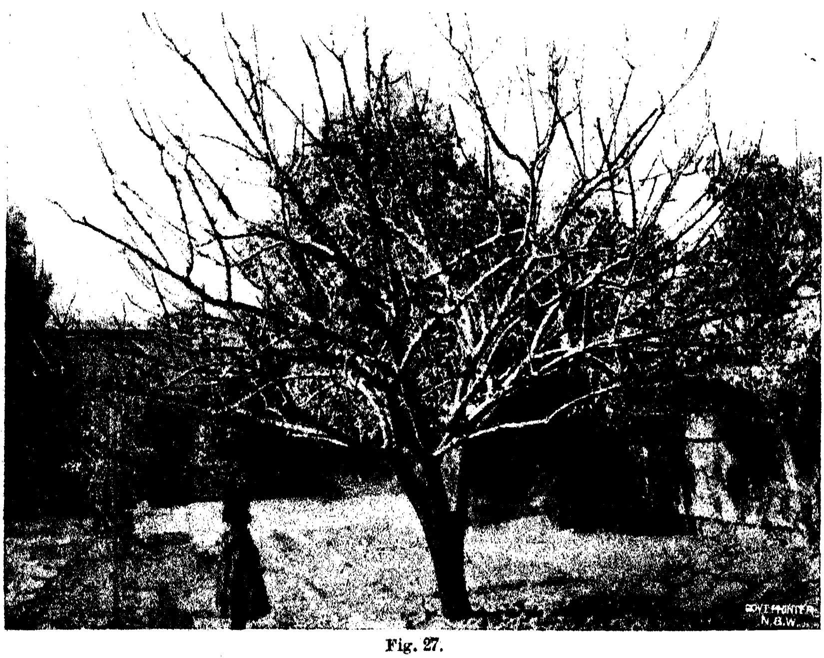


Fig. 27.

Same tree after pruning, showing short spurs on main arms and branches.

Fig. 28 (g) shows buds growing on spurs which spring from any part of the tree and may be found growing on the oldest branches. These should be shortened back, as indicated by lines, so as to keep them from over-cropping and dying. Such spurs as these will be found all through the centre of all good varieties of well pruned trees, and from such we expect to harvest some of the best fruit. On

(g) Fig. 28. (f)

(f) will be found both fruit and leaf buds. Beginning at the lower end of the cutting, there is a leaf bud between two fruit buds; a little higher, on the left-hand side, is a fruit bud with an almost indiscernible leaf bud at base; above that, on the right-hand side, is a bud similar to the one just described; while the topmost is a leaf bud between two fruit buds.

The Peach and Nectarine.

These trees give best results when formed with low heads, and as they make very strong growth they will in consequence require very hard pruning for the first five or six years. The first year's pruning in orchard should consist in cutting back, leaving only three or four main arms without any laterals (see Figs. 29–32). The second and third year they will require care and guiding. The centre must not be allowed to grow too thick, and to avoid this a certain amount of thinning out and pinching back will have to be done; but I do not approve of summer pruning these trees too severely, as I have found, from my personal experience, that we have obtained far better results where only a moder-

Fig. 29.

Fig. 31.

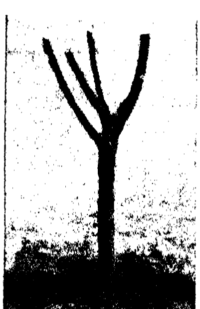


Fig. 30.

Fig. 32.

ate thinning of shoots and very light summer pruning with a good winter pruning were given. With most varieties of peaches and nectarines, the tree, as it gets older, must not be allowed to grow too thick in the centre, else that which should be good fruiting wood will never properly develop owing to the density, and will, in consequence be barren of fruiting buds; therefore, the grower should see that the centre of the tree is just open enough to have sufficient light and room for the wood to develop properly. Then, at the time of winter pruning, many of these shoots will have to be removed altogether, others cut back, leaving about six fruiting buds on each shoot. The more fruiting wood left the more fruit will be set, but the size and flavour will be poor, and the value of the fruit when marketed will also be poor. To grow good fruit, too much fruiting wood must not be left. The grower himself will be the best judge as to the carrying capacity of his tree.

We have a lot of good peach-growing country in this State; yet on the other hand we have a lot of very poor country, where the trees never attain any height or size; yet on this soil, if the trees are kept well back, good peaches and nectarines may be produced, but the crop will not be large though it will be marketable. I am sure, from the quality of fruit one sees on the market, that the majority of our growers are not in the habit of pruning sufficiently hard, if at all, as there is a very large percentage of the fruit offered for sale which is very inferior, both as to size and quality.

I have found that the trees which in the end paid best were those which were not allowed to bear any fruit (except an occasional one for the purpose of ascertaining if the tree was coming true to name) until after the third year, the first three years to be devoted to forming and developing the tree, which, if planted in suitable soil and of proper varieties, will yield a good crop the fourth year.

Over-cropping must be carefully avoided by a judicious thinning after the fruit is well set and swelling.

To sum up, winter pruning consists of shortening in or cutting off half of last year's growth all over the tree, cutting out any sickly small wood which did not mature, thinning the strong shoots out where found to be too thick, and leaving only the required number of shoots distributed evenly over the tree, at the same time performing the work in such a way as not to destroy the balance of the head. By reducing the wood one-half we reduce the coming crop by half (in numbers not in pounds), as the peach and nectarine always bear their fruit on one-year old wood; thus the remaining half will be of better size and quality, and of greater commercial value.

These trees require regular pruning every year during their lifetime, yet they are two of the hardest to prune, especially during the period when they are making heavy growth, as it is very hard for the uninitiated to know just how much to leave and where to leave it. One must have considerable practical experience before he can become proficient or even able to prune properly many trees in a day.

Trees properly looked after will continue bearing good crops of fruit for many years; but if neglected they soon run wild and deteriorate, and the fruit consequently is worthless.

Fig. 33 shows a four-year old peach-tree before pruning. It can be seen that it has made an exceedingly heavy growth, and is full of fruiting wood from bottom to top. Fig. 34 shows the same tree after pruning, and taken without having moved the camera.

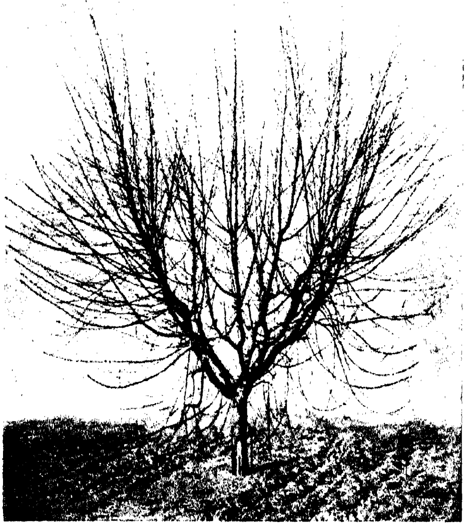


Fig. 33.

Fig. 34.

It can be seen both by the appearance of the tree itself and the prunings underneath that it has received a very severe pruning, but there is fruiting wood from bottom to top, and the tree bloomed well and set a good crop of fruit, some of which later had to be thinned out to prevent it from overbearing.

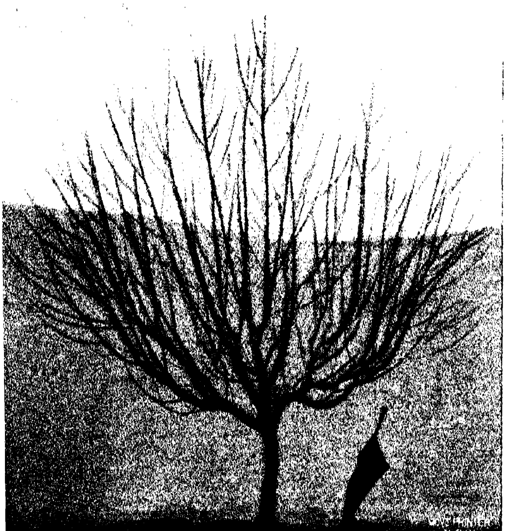


Fig. 35.

Fig. 35 shows a well-shaped peach-tree before pruning, which has put on good growth for a three-year old tree. Fig. 36 shows the same tree after pruning. The tree has been well cut back, and is still a good shape, yet it has one

fault which can be readily seen at a glance—that is, too many by one-third leading branches have been left, otherwise it is all right, and will yet make a good tree, as since being photographed it was

Fig. 36.

properly pruned, but I neglected having it again photographed, which is to be regretted, as I should have liked to have shown it properly pruned.

Fig. 37 is a peach-tree the pruning of which has been neglected, and in consequence there are no fruit-spurs or growth of any kind in the centre of the tree until the extreme ends of the limbs are reached, and to reach the lowest fruit a step-ladder is required. There are, I

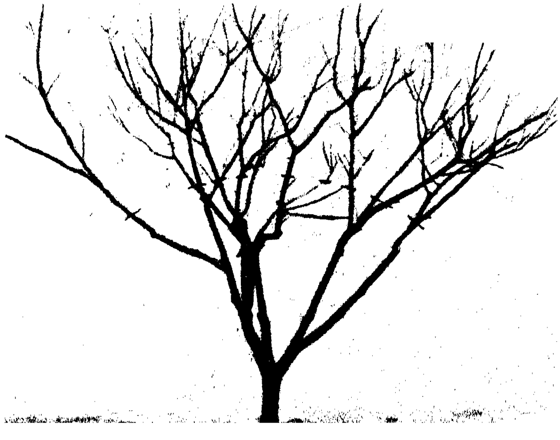


Fig. 37.

regret to say, many such as this throughout our fruit-growing districts. To bring this tree back into anything like a fair shape it should be cut off where marked. This would force out new growth from the main arms, which in another season would be the foundation of a decent tree.

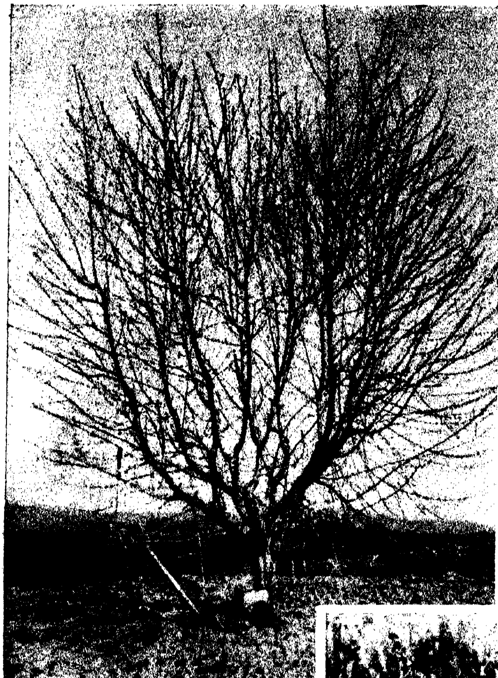


Fig. 38.

Fig. 39.

Fig. 38 is the same tree a year later before pruning as that shown in Fig. 33; and Fig. 39 shows the tree after it has been pruned. Although the tree has carried a full crop of fruit for the last two years, yet notwithstanding that and the dry seasons it has put on a good growth each year.

Fig. 40.

Fig. 40 is a peach-tree during the growing season showing fruit. It will be seen that it is fruiting from the trunk and through the centre of the tree, and is carrying a heavy crop of good fruit. It is the variety known as the "Lovell," and is one of the best to grow for canning.

Fig. 41 shows two peach branches before pruning. On all good-sized young trees will be found a great number of just such branches,

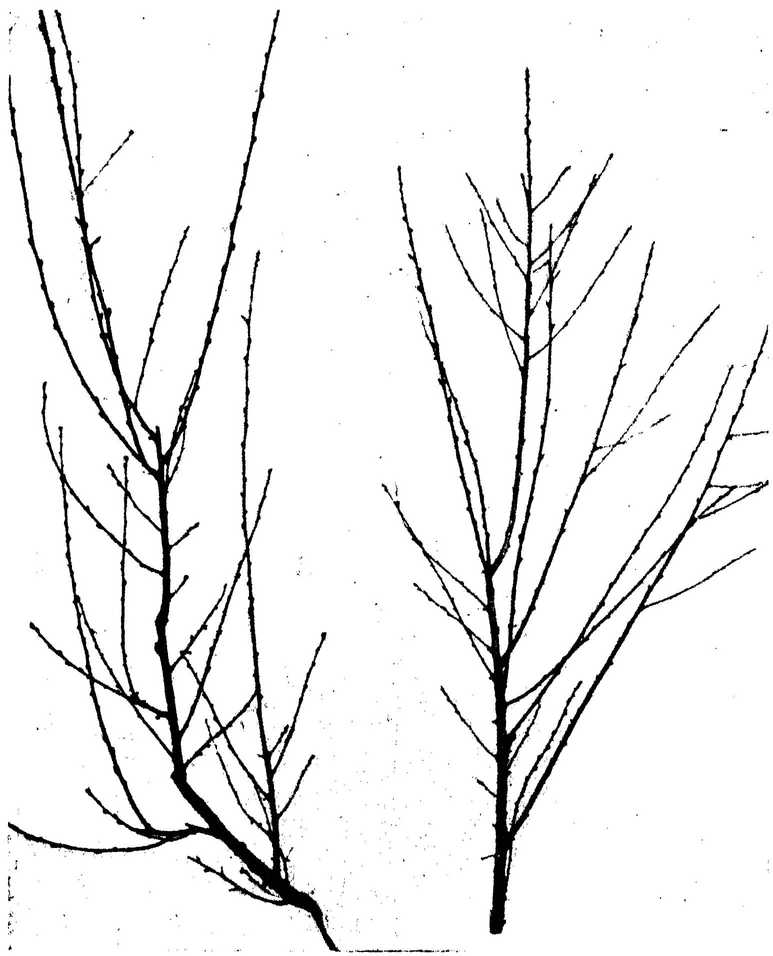


Fig. 41.

which in many instances are left with too little pruning and too much wood. These branches are covered with fruit-buds from base to tips, and if left there would be too much fruit set for the tree to mature properly.

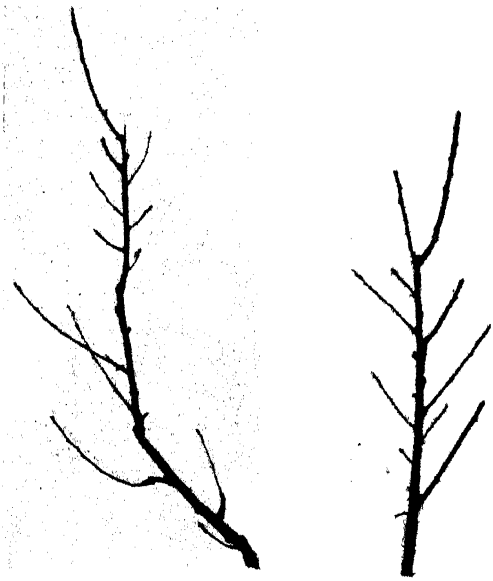
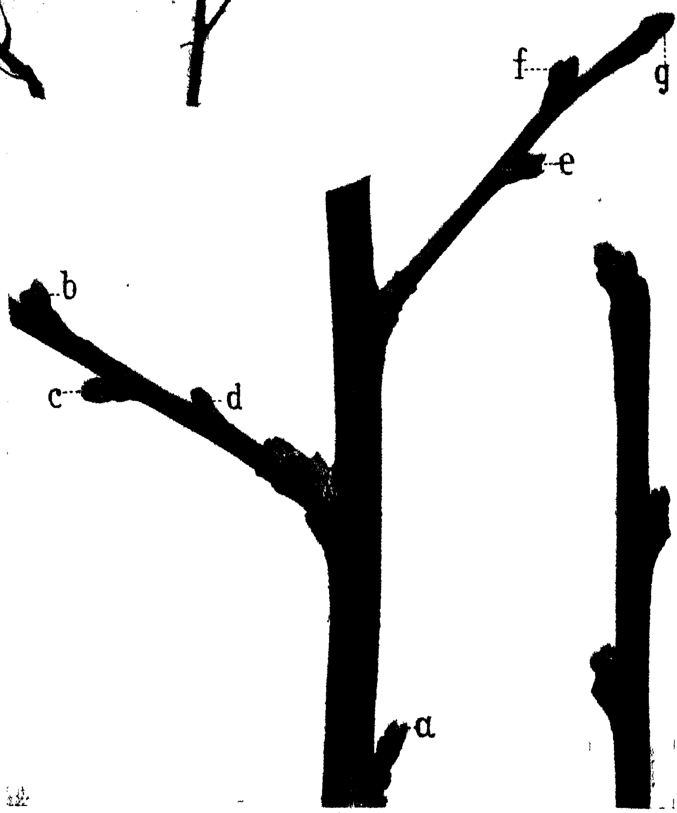


Fig. 42 shows the same two branches pruned. It will be seen that some of the side shoots have been removed, and about two-thirds of those remaining have been cut away, still leaving quite enough fruit-buds for the tree.

Fig. 42.

Fig. 43 depicts a peach-cutting with fruit and leaf buds.



B Fig. 43. A

Beginning at the top of A it will be seen that there are three buds—two fruit-buds with, in between them, a slender wood-bud, but it is so small as to be almost imperceptible.

Fig. B, portion of a cutting similar to A, but one year older. Each of the buds bore fruit and threw out two short laterals and one fruit-spur, all of which have fruit-buds, and the two former wood-buds as well. *a* is a fruit-bud with leaf-bud at its base. *b* a wood-bud between two fruit-buds. *c* and *d* fruit-buds. *e*, *f*, and *g* wood and single fruit buds.

The Plum.

The general rules for pruning deciduous trees apply to both the plum and prune, except that they will not require much summer pruning unless it be in cases where the tree makes a rampant growth, when the tops may be cut back lightly to strengthen them and keep them from being blown out of shape. The experience so far gained in this State as to the best system to adopt in shaping the plum and prune is to keep them cut well back in a similar manner to that recommended

Fig. 44.—Prune d'Agen.

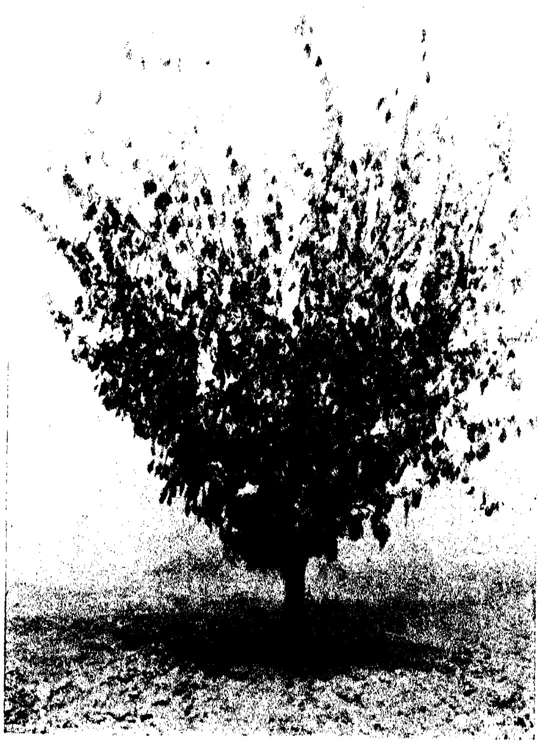


Fig. 45.—Robe de Sargeant.

for the apple and apricot. There is no doubt that many varieties of plums will do equally as well as the apricot with like treatment; but some of the prunes are a little harder to manage, more especially before they attain the age of fruiting, as the cutting hard back induces them to throw out a very dense growth, which in turn during the ensuing winter will have to be removed, as the branches grow so thick that it is found impossible to reach into the centre of the tree to pick any odd fruit which might be there. On the

other hand, if the tree is allowed to go with but little pruning, the branches are willowy, and when the tree starts to crop it is apt to overbear, with the result that in the event of the season being a dry one the fruit will drop off before it is ripe, and the tree is so weakened that during the next year it will not carry any fruit; therefore, in districts where irrigation is not carried out, I would recommend keeping the trees with a fairly open centre, leaving just enough fruiting wood to produce what one would consider to be a medium crop of fruit for the following year. If this system is adopted I feel certain

Fig. 46.—Splendor.

Fig. 47.—Giant Prune.

that the best results will follow, as should the season be a dry one (which has been the rule of late) the trees, with proper cultivation, will be able to withstand the drought and mature the fruit, as well as to produce sufficient fruiting wood to enable it to carry a crop the following year.

Where irrigation can be practised I would recommend a modified system—that is, to still keep the centre of the tree rather open, but allow the tree to carry more fruiting wood by a half than on trees grown without irrigation. This, I know, differs from the method now coming into vogue in California, where hundreds of tons of prunes

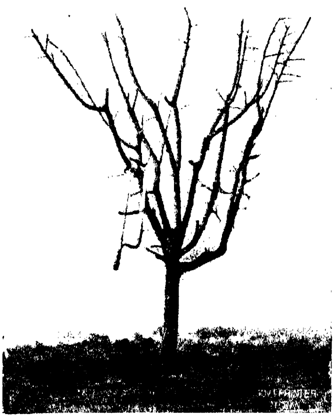


Fig. 49.

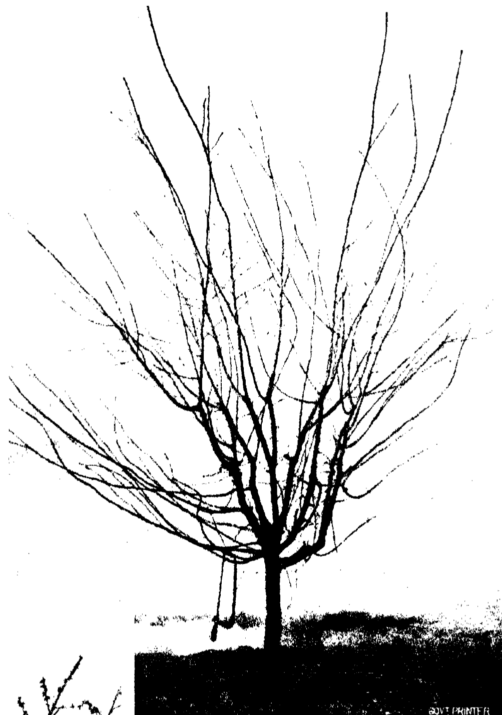


Fig. 48.

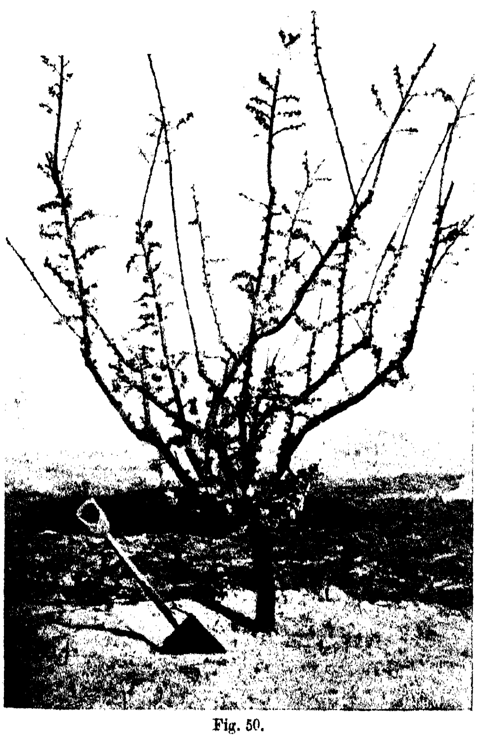


Fig. 50.

are produced, but the conditions are so different that it could hardly be expected that we could work on the same lines. As our trees attain age and size we find that they do not throw out such excessive growth, but confine their energies more to fruiting, and it is not found so difficult to prune them. This refers more particularly to the French prune (Prune d'Agen) than to the Robe de Sargeant, German, and other varieties. By referring to Figs. 44-7 it will be seen that the Prune d'Agen is the only very dense tree of the four, while the Splendor follows next,

the other two being quite open enough. Some of the plums go to the other extreme; for instance, the Burbank is a very open spreading grower, as will be seen by reference to Fig. 48 before pruning, while Fig. 49 will show how the tree looks after pruning. Fig. 50 shows the same tree pruned a year after, just as it is breaking into bloom. As there are so many different plums with varying shapes, I will have to show a few others in order that the reader may see them before and after pruning, and form some idea as to how it is done.

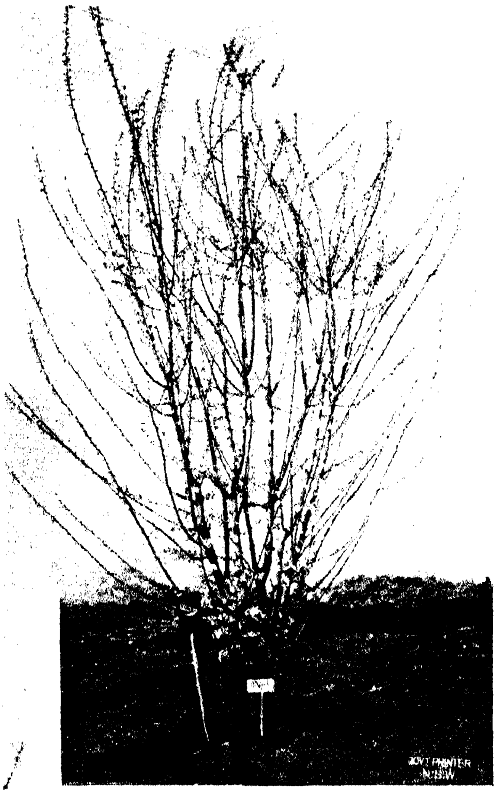


Fig. 51.

Fig. 52.

Fig. 51 shows the "Skipper" plum before it is pruned and just as it is breaking into bloom, while Fig. 52 shows the same tree pruned with the exception of shortening back the leading branches. Fig. 53 is the same tree pruned. This tree was left late to see if late pruning would have any advantage or otherwise over earlier pruning, but no appreciable difference was observed. The cuts made healed over about the same as trees pruned six weeks earlier, and the crop was about the same as that carried on other trees which were pruned earlier; and as more care is necessary in carrying out the work at this season for fear

of damaging and knocking off the buds, it is advisable to finish the work earlier, so that the usual winter dressing of lime, sulphur and salt may be applied before the buds begin to swell. If this work has to be done while trees are unpruned, it is more costly, occupying a greater length of time, and requiring more of the solution ; therefore, taking everything into consideration, the early pruning is the better for the grower to practice.

Fig. 53.

Fig. 54.

Fig. 49 shows the summer growth and fruit on a "Skipper" plum.

Fig. 55.

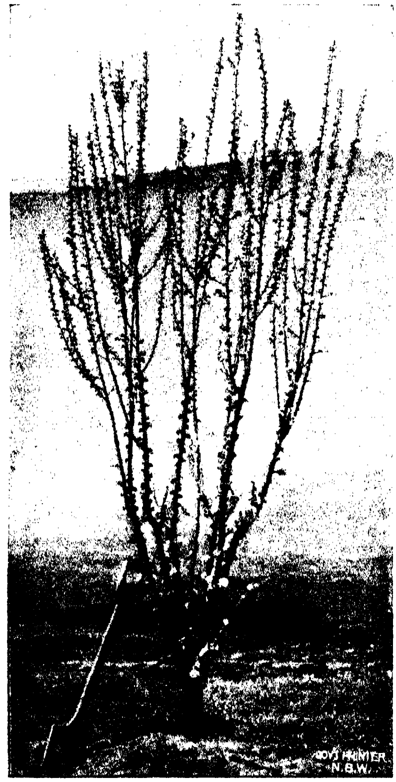


Fig. 56.

Fig. 57.

Fig. 55 shows a Wickson plum-tree in full foliage in summer.

Fig. 56 shows a Wickson plum-tree before pruning.

Fig. 57 shows the same plum-tree after pruning.

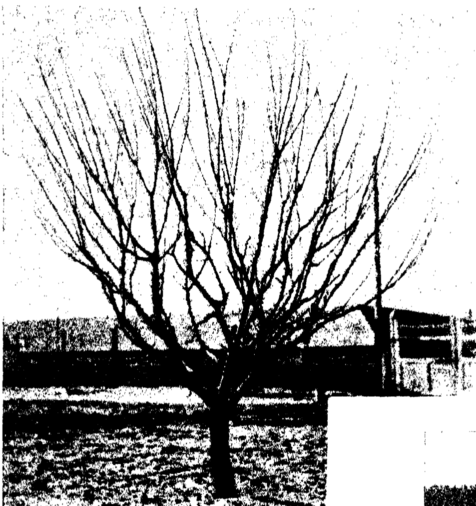


Fig. 58.

Fig. 58 shows the Satsuma Blood plum before pruning.

Fig. 59 shows the same plum after pruning.

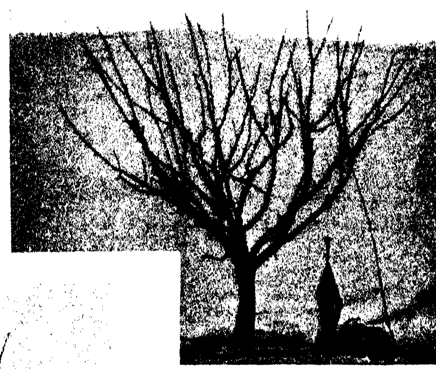


Fig. 59.

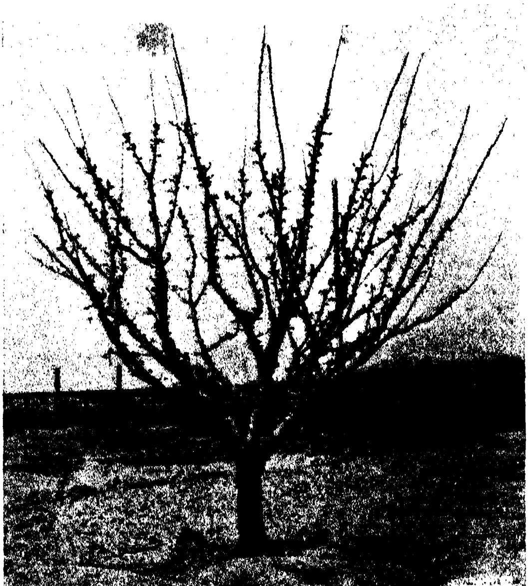


Fig 60.

Fig. 60 shows the same plum a year later after pruning.

Fig. 61.

Fig. 61 shows the same plum-tree before pruning two years later.

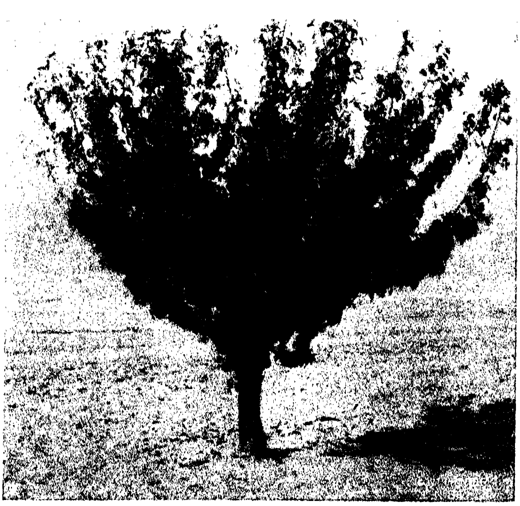


Fig. 62.

Fig. 62 shows the same plum-tree after pruning.

It might be as well to show here in contradistinction the Californian method which is coming into general practice there, and which is reproduced from Wickson's *California Fruits,* third edition. Fig. 63 shows a good form of young bearing prune-tree. The same authority says: "During the last few years, growers of the French prune, and other varieties of similar growth, have reached substantial agreement as to the best practice. The old method of cutting back bearing trees has been abandoned by nearly all growers. Cutting back the young tree to secure sufficient low branching is followed by thinning of shoots from this low head, so that the tree shall not become too dense or carry too much bearing wood. The strength in the head depends upon proper spacing and arrangement of the branches, as insisted upon in the chapter on pruning, and large, well-ripened fruit, which is essential to successful and profitable drying, is conditioned upon avoiding excess of branches and admission of sufficient light to the tree.

A rather longer central stem is retained than in the old style, and a central stem throughout is admissible if one prefers it, and does not desire to dispense with it as the first step toward securing a more open tree. Some retain the longer stem at planting; others cut back to 18 inches, develop three side branches upon that, and train the branch from the top bud for a lengthening of the stem, and bring out more branches upon that the second year. The accompanying Figs. 64–5 show this method of developing the head of a young French prune. The tree was cut back at planting in orchard to a straight switch about 18 inches high. At the end of the first summer, this showed the form in the first picture, which is marked for the first winter pruning. The second engraving shows the branching developed from this during the second summer's growth, also marked to prune away some undesirable branches. Upon a tree of this form further cutting back is not desirable, as it has

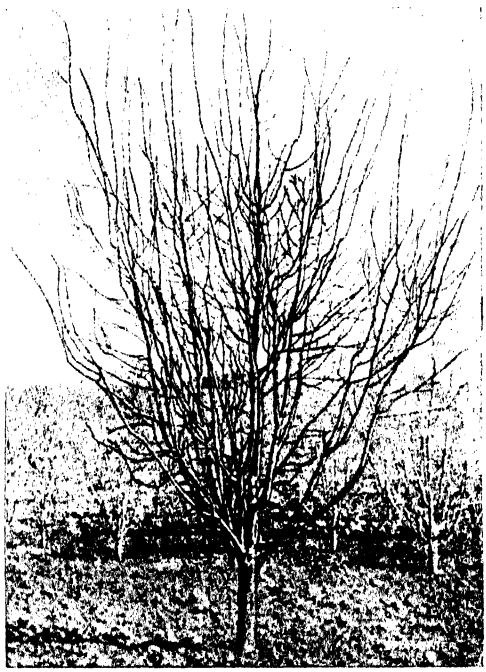


Fig. 63.

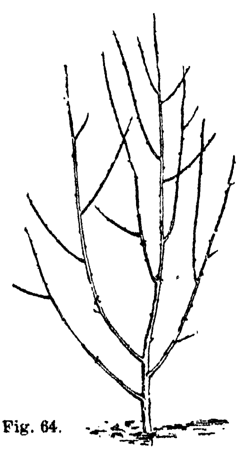


Fig. 64.

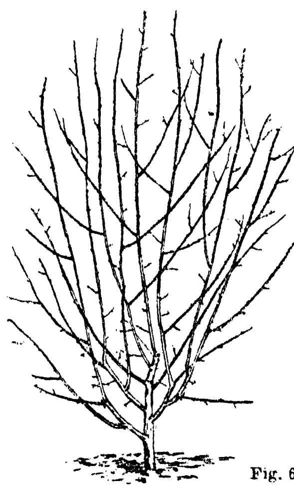


Fig. 65.

enough well-placed branches to form the tree. How long cutting back shall continue depends partly upon the locality, and partly upon the

notion of the owner. In interior localities, the tree grows with great rapidity, and branches more freely. During the third summer it will bear some fruit if not cut back the previous winter, and, where growth is so rapid, there is little danger of injuring the tree by early bearing. In the coast valleys cutting back may continue another year, and fruiting be thus postponed a year to get another summer's freer wood growth. Though cutting back may properly cease early with the French prune, it is a great mistake to allow the tree to go un-

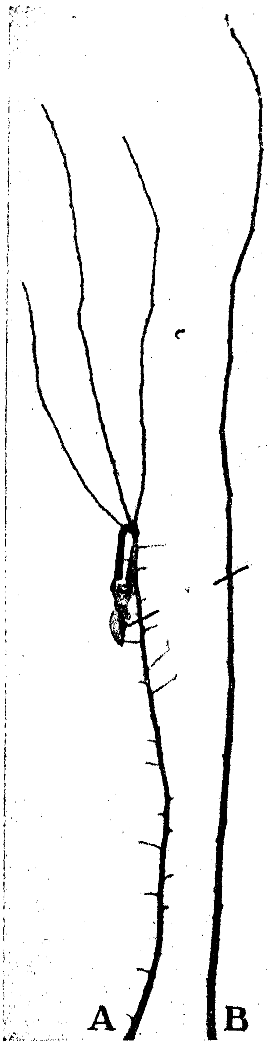


Fig. 66.

B Fig. 67. A

pruned. Removal of defective wood, and prevention of branch crowding and overbearing, are of the highest importance, as insisted upon in the chapter on pruning."

I consider that the "Prune d'Agen" is the hardest variety of the plum which we have to deal with; at least we find it so, and in our experimental orchards we have 125 different varieties.

While some varieties of plums bear their fruit on last season's growth as well as on spurs, others, it will be found, bear mostly on spurs or two-year-old wood. Fig. 66 shows two branches of the French prune; A is one taken from a tree that was not cut back last season, while B is taken from an adjoining tree which was severely cut back; A has put

on a little growth, and has developed fruit spurs on the whole of last season's growth and is ready to carry a crop of fruit next year, while B has only thrown out a good wood growth, and the shoot shown has no fruiting wood on for next season; therefore, when a prune tree has attained a certain age it is found best to leave a moderate amount of wood so as to ensure a fair crop of fruit for the ensuing year. In the case of A and B above, the former had too much by half left on it, while the latter was cut back too severely by half, and during the coming winter they should be cut off just where the line crosses them, when very good results may be expected.

Fig. 67, A, shows wood of last season's growth with only one fruiting bud, while B is two-year-old wood of the same variety with fruiting spurs. The buds develop on the Japanese and some American plums just as they do on the apricot—that is, with twin and clusters of fruit buds, with a leaf bud in the centre.

The Apple.

This tree when young should be formed on much the same lines as the apricot, although many prefer starting it a little higher than, say, 2 feet. It is well to see that the limbs are started from the stem of the tree at different points, and at distances of about 6 inches apart, radiating around the stem. This will give each branch a firm hold of the trunk, thus laying a good foundation for the future large tree.

While the tree is young and growing thriftily it will be found advisable to pinch back, once or twice during the summer, much of the young growth found shooting up through the centre of the tree. These short spurs will shade the branches, and this pinching back will keep the centre of the tree from becoming too dense, and encourage the development of fruiting wood on both spurs and branches (see Fig. 68). A portion of a branch is photographed, showing fruit, and fruiting spurs carrying fruit-buds for the next season's fruiting.

It may not be out of place to mention here that the secret of fruitfulness is not to be found in fancy systems of pruning, but by a close study of the requirements of the

Fig. 68.

Fig. 69.

Fig. 70.

tree in the particular place where it is growing; and when once a system is found under which the tree appears to do its best, follow it up and improve on it from time to time as its weak points may be found out. Trees in Australia require a different system to that adopted in Europe, as the conditions under which they are growing are in no wise similar; therefore, to any growers who have learnt their methods in European fruit centres, I would point out the desirability of remembering these different conditions, though at the same time the experience gained

Fig. 71

there will be of great assistance to them here.

To continue, then, with our pruning. The head of the tree should be properly thinned out, and for the first few years the whole aim should be to grow a strong, healthy tree, with a well-shaped head. When this object has been attained, and due precaution has been observed in selecting such varieties as are suited to the individual district (for it must not be forgotten that all varieties will not crop well in every district or climate) the future success of the tree should be ensured. After

Fig. 72.

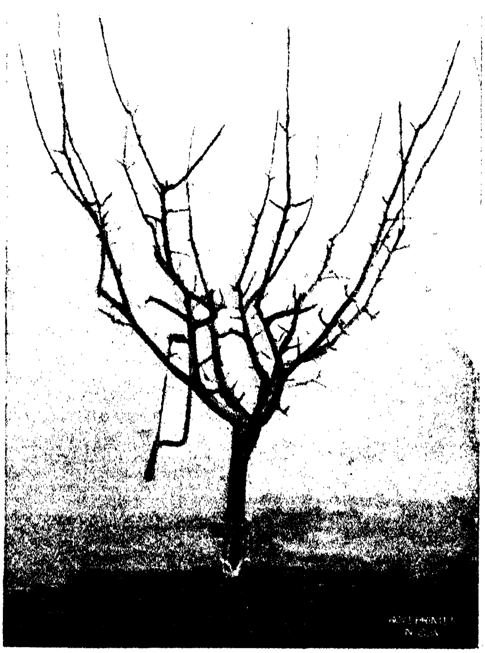


Fig. 73.

once the tree has been properly formed and has commenced to bear regular crops, very little pruning is required beyond the usual winter clearing out of dead and worthless wood, and the removal of such shoots or branches as have become out-placed by branches better situated, and which neither crowd nor tend to put the tree out of balance.

Like other fruit trees, the apple will not bear regular crops without due attention, and a regular system of pruning; for instance, every other year they will produce heavy crops of possibly inferior fruit, while the following year will see little if any fruit.

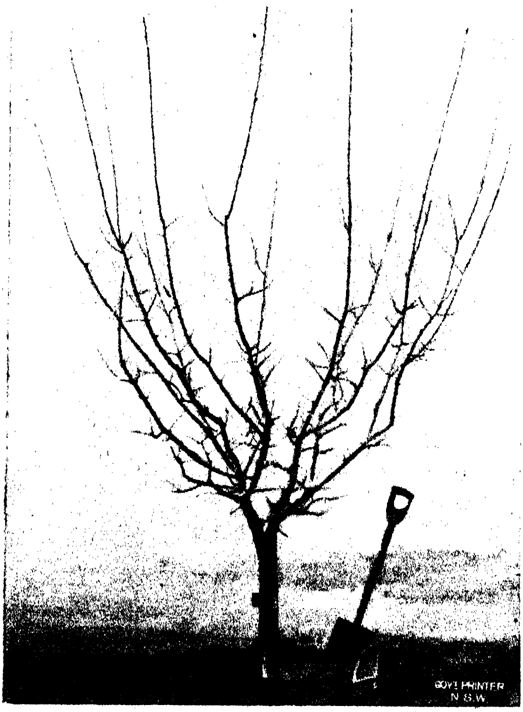


Fig. 74.

Fig. 75.

By giving the trees a heavy pruning the winter prior to the anticipated heavy crop, and thinning after the fruit has set, the crop may be so reduced that the strength of the tree will not be exhausted; the quality of the fruit will be improved, and the prospects for the ensuing year's crop greatly strengthened, as the tree, while still bearing a good profitable crop, will not have its energies over-taxed, and in consequence, will stand a much better chance of setting its fruit the following year.

Heavy winter pruning induces wood growth; judicious summer pruning, when trees have attained bearing age, causes the tree to develop fruit-bearing wood; root pruning arrests growth, and promotes fruitfulness (this latter, however, we have had to practice to a very limited extent only); and thinning crowded spurs and blossom buds favours a good set of fruit.

In warm districts it will be found best, after once the tree has been properly shaped, to prune very lightly. The observer will notice that different varieties of apples have entirely different forms of growth; some naturally assume a good shape, others spread out very wide, while others again make a very close upright growth. In

the case of a spreading tree, always prune to an inside bud; an upright tree to an outside bud; and keep the tree well cleaned out during its growing period. For example, the "Perfection" and "Rome Beauty" are both very upright growers, while in some districts the "Jonathan" is a very spreading tree; the "Five-Crown Pippin," on the other hand, being naturally an easy tree to form.

A reference to Fig. 69 will show a "Ben Davis" apple tree which has been summer-pruned, but which has not yet been winter-pruned; while Fig. 70 shows the same tree when pruned. Fig. 71 shows the same tree carrying its fruit. Only a little of the fruit can be seen, owing to the heavy foliage, yet the little which can be seen shows it growing on the main branches, where it is well protected, and of good quality. The tree is only young.

Figs. 72 and 73 show a "Rhode Island Greening" apple tree, before and after pruning. The tree had been well summer-pruned the previous year, and this year it has produced some excellent samples of fruit, which among others were exhibited at our Royal Agricultural Show. Figs. 74 and 75 show the same tree before and after pruning a year later. Figs. 76 and 77 show two four-year-old trees at time of blossoming, where it can be seen that the bloom is well distributed

Fig. 76.

Fig. 77.

Fig. 78.

and fully demonstrating the result of this system. Fig. 78: A tree which has been growing in a rich flat, having plenty of room, but lacking either cultivation or pruning, yet bearing heavy crops every alternate year. It could with advantage be brought back into a better shape.

Figs. 79 and 80 show a young tree before and after pruning. This is a particular variety of apple which does not throw out many leading branches, and is inclined to grow very open.

Fig. 81 shows a "Strathden" apple before pruning; Fig. 82 the same tree pruned; and Fig. 83, a tree of same variety carrying foliage and fruit.

Fig. A is a cutting of last season's growth of apple-wood, showing leaf-buds, while B is a portion of a branch two or more years old which has pro-

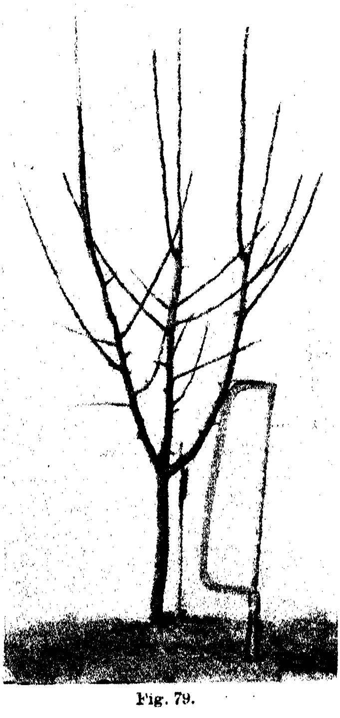


Fig. 79.

Fig. 80.

A B

duced fruit spurs along its entire length. Throughout some varieties of trees such spurs will form without any trouble, while with other varieties it is found most difficult to start such wood—in fact it is impossible to develop much until they attain a good age; still in many cases systematic winter and summer pruning will hasten its development.

As these spurs bear fruit and extend in length it will be found necessary to remove some and to keep the remainder shortened back and thinned out. Fig. 84, it will be seen, is a spur four years old. The first year it started in the form of a lateral from the main branch, and was cut back at A. It then threw out two shoots, B B, and was cut off at b b the following winter. During the same year it threw out the fruit-spur, C. The following year C bore an apple at point D,

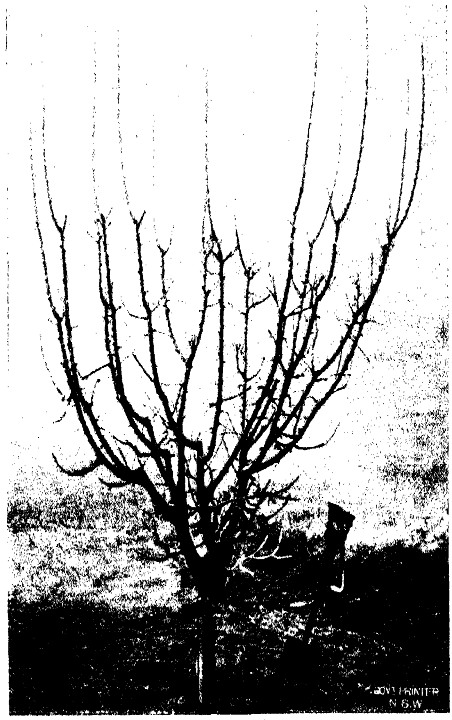


Fig. 81.

Fig. 82.

Fig 83.

and extended to point E, while B, on the right, extended to point F, and B, on the left, developed two shoots, one of which the following winter was cut off at G, and the other, H, was allowed to remain untouched, being a fruiting spur. This latter spur bloomed the following season at I, but the fruit did not set. G threw out a fruiting spur, terminating at J, while F threw out one, terminating at K, and E bore an apple. The following year the bud at K bloomed, but did not set any fruit, and extended to M. I extended to N, while J carried fruit and threw out two side spurs, O and P, and E extended to L, and during the same year fruit-buds developed at Q, R, and S. It is somewhat difficult to follow the extensions from year to year, yet it can be seen that this spur has gone steadily ahead until now it has eight blossom buds, which would have been a very good prospect for the coming season's crop had the spur been allowed to remain on the tree. However, eight buds would have been too many to allow to remain on this spur, which is shown full size, and, therefore, I would have cut it off just at t t, where marked above the buds Q and R.

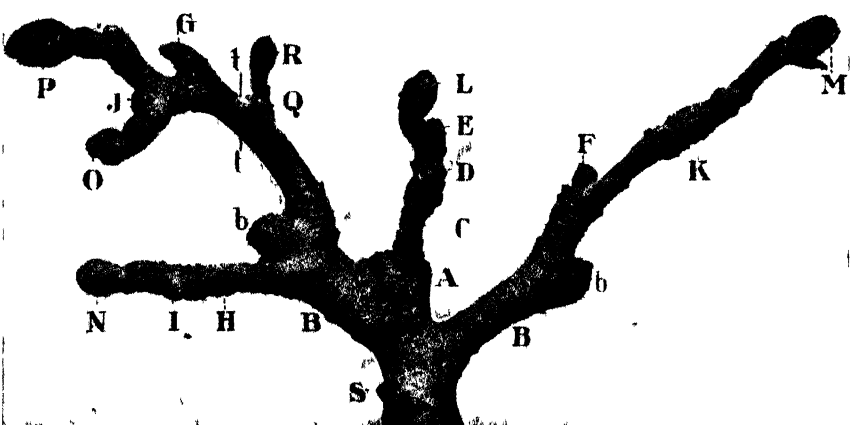


Fig. 84.

(*To be continued.*)

Phylloxera-Resistant Vine Stocks.

M. BLUNNO.

As a large number of phylloxera-resistant vine stocks are now available for sale at the Howlong Viticultural Station, it is thought vignerons who contemplate procuring some may be interested in details as to the history of the stocks and the manner in which they are propagated. These vines were originally imported from France in order to encourage the reconstruction of vineyards destroyed by phylloxera or the planting of new vineyards in districts closely menaced by this destructive pest. These phylloxera resistant vines do not bear grapes unless the ordinary grape-bearing vines are grafted on them; therefore they can only be used as stocks.

I wish to make it clear that although they resist the attacks of phylloxera, they are not immune. I mean they may be infected with this disease like any other vine, yet not be destroyed by it; and they may become the means of conveying this pest from one vineyard to another. That is the reason why in all European vine-growing districts the traffic of phylloxera-resistant stocks is under the same restrictions as ordinary vines.

In the first instance the vines were obtained from America, where they grow wild, but the work of classification and selection, the study of their adaptation to the different soils, of their propagation, faculty to take the graft of the grape-bearing vines, and other important questions of vine-culture were initiated and carried on in France, and now the same researches and experiments are carried on in other parts of the world.

There are eighteen pure species of vines of American origin, and among them are a few which have been found by experience to be adapted for the reconstruction of phylloxera-infected vineyards.

Two species in particular have been found the most suitable for our conditions, viz., Vitis Riparia and Vitis Rupestris.

During the last few years a great deal of study has been devoted to the Vitis Berlandieri for the planting of soils eminently rich in lime. From every species several types have been evolved through numerous seedlings, of which a careful selection was made afterwards. To-day there are in consequence several types of Riparia, Rupestris, Berlandieri, &c., each having special characteristics of its own that make them answerable to particular conditions of soil, climate, propagation, and cultivation.

Besides many natural hybrids (cross-fertilised) of the different species, many have been obtained by artificial cross-fertilisation and the experience of several years has succeeded in selecting a number of them for practical use.

The different types of Riparia will grow luxuriously in rich, loose, deep, fairly moist soils. The roots are slender, tough, long, but with a tendency to expand horizontally and close to the surface of the soil.

The vines are long, rather thin, with long joints, the foliage is abundant, and the general tendency of the vine is to spread.

It is as easily propagated by cuttings as any ordinary grape vine; takes the graft very well, but the scion usually outgrows the stock.

Grapes ripen earlier when grafted on this stock, and the crop obtained is larger than that of the same variety, but grafted on any other stock, except perhaps one or two Franco-Americans.

Rupestris grows in stiff, clayey, or gravelly or shaly soils. The roots are thick, fleshy, with marked tendency to push through the deeper layers of the soil. The Rupestris, therefore, is more suitable in grounds habitually dryer and in districts not frequently visited by summer showers. Canes are thick, short-jointed, and erect. This species propagates by slip just as readily as any ordinary vine. The rooting is enhanced if the eyes on that portion of the cutting which will go underground are cut off. It grafts easily, but should be grafted when it is young.

One of the best forms of Rupestris, viz., the Rupestris du Lot, is apt to grow too many suckers, which is rather an inconvenience, particularly during the first year of the graft. It is advisable to cut all the stocks to be grafted about one month before the grafting season, so as to allow the stem to bleed profusely. The stem is cut about two inches above ground, and cut again level with the ground or half an inch below when proceeding to graft. The abundant bleeding that occurs during the interval will check the tendency of the stock to grow too many suckers.

Rupestris stocks will grow in soil with a quantity of lime up to 30 per cent.

Riparia and Rupestris hybrids will grow in soils of medium texture, their botanical characters participate of the two parents, and under special circumstances these crosses are more suitable than one or the other parent stock. Such hybrids being between two pure American species are called *Americo-Americans*.

Some species of American vines have been cross-fertilised with the ordinary European grape varieties. Thousands of the hybrids have been obtained, but experience has fixed itself on a smaller number. The European blood confers on the hybrid a ready adaptability to soils of various kinds, a greater facility to propagation by slips, better attitude to take the graft, but for many of them their phylloxera-resisting power is not quite beyond doubt, particularly under hotter climates. These vines are called *Franco-Americans*.

Among them there are a number called direct bearers, *producteurs direct*, because, unlike the pure American species and their hybrids, they bear grapes without the graft; but, so far, the crop has been found to be unworthy either for wine-making or for eating. Everybody knows the Isabella vine, the Catawba, Elvira, and other American grape-bearing sorts with the peculiar foxy taste of the fruit. Many growers might be under the impression that they are phylloxera-resistant. I caution them against this rather widespread belief. They generally resist the attack of phylloxera a little longer than the ordinary European vine, but will succumb all the same.

1 2 3 4 5 6 7 8

1. Gordo Blanco on Rupestris Metallica.
2. Gordo Blanco on Riparia x Rupestris No. 2.
3. Malbeca on Rupestris du Lot.
4. Madeira on Riparia x Rupestris No. 1.

5. Baxter's Sherry on Rupestris Mission.
6. Baxter's Sherry on Riparia x Rupestris No. 1.
7. White Hermitage on Rupestris Mission.

8. Alicante on Rupestris du Lot.
This vine is the result of grafting *in situ*, the stock having been planted out a year before the grafting was performed. The others (1–7) were united as cuttings, and the whole growth is accordingly only a year old.

BENCH-GRAFTED VINES FROM HOWLONG VITICULTURAL STATION.

Said sorts are either varieties of the Labrusca species, which is very low down in the scale of resistance, or hybrids in which Labrusca blood predominates. All phylloxera-resistant stocks require a soil worked to at least 18 to 20 inches.

When the reconstruction of the vineyards destroyed by phylloxera begun in Europe many failures were recorded, because of the indiscriminate use of stocks, some of which were not at all phylloxera-resistant, some others were unsuited to the soil, and others were resistant enough under certain climates but not under certain others. The early death of the vineyard was thus accredited to various reasons, but seldom the vigneron blamed himself. I advise vignerons to apply to this Department for information on this subject; they should state nature, texture, and depth of soil and subsoil. If chemical analysis has been made it is advisable to forward the result with the other information. If the soil is patchy it is absolutely necessary to give full details of every change occurring in the soil and subsoil, because in such case different sorts of stocks may be required.

Bench-grafting by Machinery.

The chief function of the Howlong Viticultural Station is the production of one-year-old vine rootlings ready grafted. By ready grafted I mean vines having the roots of a phylloxera-resistant variety, and the upper portion of a variety suitable for wine-making, or for table grapes.

The demand for such ready grafted vines is increasing. Many vignerons who intend to make extensive plantations do not care to buy the stocks, and then do the grafting themselves. It is evident that a vine-grower who intends to plant, say 40 acres, of a new vineyard, which should defy the attacks of phylloxera, finds that it would be a very expensive, lengthy, and toilsome enterprise to plant about 40,000 stocks, and make the following year 40,000 grafts *in situ*. The most enterprising grower would be deterred from an undertaking presenting such difficulties as this.

In Europe the respective Governments and provincial-authorities of vine-growing countries during the last few years have encouraged by all possible means studies and experiments in connection with grafting on phylloxera-resistant stocks in order to devise some speedy method of turning out as many millions of ready-grafted vines as required by the urgent and big demands of growers who had to reconstruct the thousands of acres destroyed by phylloxera. The untiring energy of experts and their ingenuity triumphed at last, and now we have a system of bench-grafting, whereby the rooting of the portion resistant to phylloxera and of the knitting together of this with the portion destined to bear, is obtained in the same year.

The proportion of successful grafts varies between 40 and 90 per cent. according to the surrounding circumstances, and to the care taken from beginning to end.

A proportion of 40 per cent. appears at the outset very low, but I need not mention that such percentage only refers to unfavourable conditions. Yet even then, if we consider that the cost of the cuttings

is trifling, and that a man and an assistant can turn out at least 4,000 grafts per day, no person will deny the superiority of the system, which is still enhanced by the saving of a year compared with the ordinary method of grafting *in situ.*

Furthermore, several special machines have been constructed for doing the various sorts of grafts, while several devices have been suggested to obtain the rooting of the portion resistant to phylloxera and the knitting together the same year of this with the portion destined to bear.

The bench grafts are done indoor by hand or by machines, then they are placed in proper callusing-beds for from six to eight weeks, and are planted in nursery in spring to root. The number of grafts that can be so made is more than ten times that which can be made on a stock already in the ground. The bench-grafts are better than those made *in situ,* because the work can be done neater at the bench than out in the vineyard, where the vigneron would have to work for several days in a kneeling position. Bench-grafting can be done well through the winter, but grafting in the vineyard can only be done early in spring. Bad weather will not interrupt the former, while it will delay the latter; and most important of all, after the great output, bench-grafts make it possible to turn out in one year a vine-rootling that will be resistant to phylloxera.

Several patterns of machines are now employed for bench-grafting whereby the cutting, trimming, and splitting of the portions to be grafted is made easily, more speedily, and more precisely.

Upon my suggestion, the Department imported four different sorts of such machines, viz.:—One Greffoir Renaud, for the whip and tongue graft; two Darenne's machines for shoulder grafts; one Roy Polygreffe, whereby the inventor claims to be able to make eight different sorts of bench grafts.

After due trial, I kept working the Greffoir Renaud and one of the Darenne's machines as the simplest and most suitable.

In the way of an experiment we made a few hundred bench-grafts. We chose the whip and tongue and the shoulder methods of grafting that appeared to me more rational and, at all events, easier to perform with the brand of machines we had.

The cuttings which were used for stocks came from the Wollongbar Experimental Farm because the young vineyard of the Viticultural Station had not borne, as yet, any wood thoroughly ripe and of a suitable thickness. The sorts of stocks tried on were the Riparia x Rupestris 3306 and 3309 and the Rupestris Mission; but it appears that the canes having been several days out on the journey from the Richmond River to Howlong arrived at the station in a state far from what they ought to be for this sort of work. The scions also were obtained from outside places.

We improvised a callusing bed made of a deep layer of sand resting on a heap of horse-dung. No proper arrangement could be got ready so that a certain even temperature might be maintained throughout the callusing period, only a tarpaulin was thrown on the bed in the evening and removed in the morning if the weather was fine and not

cold. In October they were removed and placed in nursery, and received occasional waterings and that amount of attention that could be given by the Superintendent, who had his hands full with other very urgent work in which there was a good deal more at stake.

It is too soon yet to say what the result will be, but, having during my last visit to the Viticultural Station made an examination of them, I am confident that a good many will succeed. The principle is thus established then that the Department can turn out ready grafted vines one year old. The percentage of the successful ones in this trial cannot affect the principle, because this experiment was only to try the machines, while as to the indispensable precautions and subsequent cares we had neither the proper canes to work on nor had we made suitable arrangements, which will be made when this work is started on a large scale.

A Collection of Table-grapes grafted on Phylloxera-Resistant Stocks.

No sooner had the existence of a Viticultural Station come under public notice than numerous applications were received for a number of different varieties of table-grapes.

The general public did not know that the principal object of this institution was that of supplying phylloxera-resistant stocks, and expected therefore that such a place should also be able to supply almost every variety fancied by every grower. The demand is so great and insistent, although this Viticultural Station is only at its inception, that I thought it well to lose no time in taking steps for the formation of a collection of table-grape varieties, although this was not in the original programme on which the institution was started.

An odd section of 464 stocks of Rupestris du Lot, originally intended for the production of cuttings of this splendid sort, were utilised, and table-grapes of twenty-nine varieties were grafted on them. We have thus twenty-nine rows, every row of sixteen vines of one variety.

Having started a collection, it naturally follows that we should increase the assortment, which I intend to do within the limits imposed by circumstance of space and the other exigencies of the main object of the Viticultural Station.

The 464 grafts have so far succeeded so well that they have been the object of admiration of all visitors.

This is the list of the twenty-eight varieties :—

1. Black Ferrar.
2. Alicante.
3. Black Champion.
4. Black Turk.
5. Gros Maroc.
6. Gros Colman.
7. Gros Guillaume.
8. Ulliade.
9. Mrs. Prince's Black Muscat.
10. Lady Downe's.
11. Black Prince.
12. Barbarossa.
13. Red Prince.
14. Temporano.
15. Jerusalem.
16. Malaga.
17. Crystal.
18. Royal Muscadine.
19. Waltham Cross.
20. Duke of Buccleugh.
21. Syrian.
22. White Nice.
23. Cornichon Blanc.
24. Pearson's Golden Queen.
25. Malvasia.
26. Baxter's Sherry.
27. Mrs. Pearson.
28. Green Guascogne.

Importation of Folle Blanche Cuttings for Brandy-making.

The advent of Australian Federation, among other changes, was to bring the Customs laws and excise of the different States into unity; furthermore, it was sure to bring about a differential duty on imported spirits throughout the Commonwealth. I foresaw, then, the possibility of New South Wales producing its own brandy, and the brandy-making industry becoming one of the best assets of national wealth. Many districts in this State are highly suitable for the production of choice *eau de vie*, and to make a start in the proper direction, I suggested to import some cuttings of Folle Blanche vine, which is the variety of grapes grown in the two Charentes (France), whence comes the famous Cognac fine Champagne.

Some time in April, 1901, 6,000 slips of *Folle* arrived from France, and were planted in nursery to form a stock from which the requirements of intending growers may be supplied.

Importation of Fifteen Varieties of choice Chasselas Grapes.

With the cuttings of Folle Blanche, this Department imported also 6,000 of Chasselas grapes, comprising fifteen kinds, of which I give the full list below.

An improvement of the varieties of table-grapes grown in New South Wales is desirable. Many sorts of questionable quality are now grown in this State. Generally, one of the principal requisites of table-grapes much sought after by the New South Wales vine-growers is that bunches should be large and showy, almost irrespective of aroma and flavour. It is my desire to bring under the notice of growers of table-grapes varieties which for aroma or flavour, flesh, skin, keeping qualities, and other real intrinsic requisites are most worthy of cultivation.

The preference often given to the coarsest sorts against a Chasselas is possibly due to want of information as to the superiority of varieties that have been overlooked.

VARIETIES of Chasselas available.

1.	Chasselas Blanc.		9.	Chasselas	Fendant	Blanc.
2.	,,	de Fontainebleau.	10.	,,	,,	roux.
3.	,,	de Jésus.	11.	,,	,,	vert.
4.	,,	de Jericho.	12.	,,	,,	
5.	,,	Juillet.	13.	,,	Napoleon.	
6.	,,	de Montauban.	14.	,,	Rose.	
7.	,,	des Bouches du Rhone.	15.	,,	vrai Muscat.	
8.	,,	Duhamel.				

The purchase in France of cuttings of Chasselas and Folle Blanche was conditional upon official certificates, accompanying the shipment, that they were obtained from districts free from phylloxera and black rot; also that they had been disinfected against both these diseases previous to being shipped.

With the bill of lading, a certificate of health with reference to black rot and the certificate of disinfection against the two-named diseases came to hand; and as to that referring to phylloxera, we were assured it was forthcoming.

The cuttings meanwhile arrived, and as it was thought that it was at the risk of losing them if we had to wait for the phylloxera certificate, I decided to forward them to the Howlong Viticultural Station without delay, where they were unpacked and disinfected in the usual potassium cyanide solution; then stratified in sand, while all packing was destroyed by fire.

Prior to planting, they were disinfected again in a solution of lysol of the strength of 1 per cent. The promised certificate not coming, and it being time to plant the cuttings in nursery, I felt it incumbent to take still further precautions short of destroying the lot of them, in spite of the opinion of many experts that cuttings of *vitis vinifera* are not apt to carry phylloxera, and in spite of the repeated disinfections to which they had been subjected.

I then had a tank excavated to a depth of 20 inches, which was filled with pure sand, obtained from a sand-rise in the adjoining forest reserve. In this sand-bed I planted the cuttings, and in order to remedy the poorness of this raw material, just dug out from a depth of 3 or 4 feet, a quantity of potassium nitrate was given at the time of the watering.

This way of fertilizing would not alter the texture of the sand, which would so keep its phylloxericide action.

Needless to say that these cuttings are not close to any other vine in the place, and that they are under observation; also, that they will be all inspected and disinfected again before distribution.

Blackleg in Cattle.

Mr. Andrew Smith, of Six-mile Creek, Pambula, writing about blackleg in cattle, says:—"I always inoculate with garlic for blackleg. I have had several visitations of the disease amongst my stock during the last thirty years, and have never known garlic to fail. I continued to use it for several years at branding time, and had no trouble, but the disease came when for a time I dropped the use of garlic. Last November I lost a heifer. The rest of the young cattle were inoculated with garlic, and no deaths have occurred since, although the mortality is very great in the district. The operation is simple. The dewlap is opened wide enough to admit a 'pod' of garlic, and a single stitch is made to keep it in."

Mr. J. D. Stewart, M.R.C.V.S., Veterinary Surgeon to the Stock Branch, to whom Mr. Smith's communication was referred, reports:—"Inoculation with garlic as a preventive against blackleg is practised with varied success. Personally, I have no great faith in it, and rely on vaccination with attenuated micro-organisms of the disease, which causes a mild non-fatal attack of blackleg that confers immunity against the disease being acquired naturally."

N.S.W. Lambs and Tegs in London.

Australian lambs in the London market have lately come in for a lot of unfavourable comment, and there is no doubt our trade has suffered a considerable set back in consequence. The Department has been endeavouring for some time to obtain the most reliable information possible for the guidance of shippers, and has been a good deal hampered by want of proper material to submit for expert review. It is always possible, of course, to obtain from various sources sufficient prime carcases to make up an attractive parcel, but the reception of such a parcel in the London market, and the opinions of experts with regard to it, mean, for all practical purposes, nothing. The only thing for the Department to do was to endeavour to make up a shipment of lambs of first cross and of second cross, and of as wide a range of breeds and weights as possible, so as to afford the London experts suitable material for instructive comment and comparison. It has taken some years to get the diversified crosses, and it was not until last July that the Department was in a position to forward, from the Bathurst Experimental Farm, material concerning every feature of which recorded particulars were available for reference, and to provide a definite standard for purposes of comparison.

The parcel was made up of 126 lambs of first and second crosses and 16 tegs (details of breeding, age and weight as given hereunder), and Messrs. Birt, Hughes & Co. were asked to submit to two independent experts in London a series of questions drawn up by the Chief Inspector of Stock, Mr. Alex. Bruce, and touching upon the points concerning which information is most needed by Australian shippers.

The lambs and tegs left Sydney in the "Maori King" last July, and were handed over to Mr. H. Rawson and Messrs. Knowles and Perfect, meat trade experts of the highest standing in Great Britain, for report and replies to the questions submitted.

PARTICULARS OF SHIPMENT.

Description of First-cross Lambs.

Shropshire Ram—Merino Ewe :
6 lambs, each 4½ months, 34, 33, 34, 39, 30, 32 lb. respectively.

Southdown Ram—Merino Ewe :
23 lambs, each 5½ months, 30, two 31, three 32, five 33, 34, two 35, two 36, 37, 38, 39, two 40, two 41 lb. respectively.

Border Leicester Ram—Merino Ewe :
6 lambs, each 4½ months, 29, 31, 32, 33, 36, 39 lb. respectively.

Lincoln Ram—Merino Ewe :
11 lambs, each 5½ months, 31, 32, 33, 34, two 35, 36, two 37, 38, 41 lb. respectively.

Romney Marsh Ram—Merino Ewe :
10 lambs, each 5½ months, 32, 33, two 34, two 35, 36, 37, 38, 40 lb. respectively.

English Leicester Ram—Merino Ewe :
14 lambs, each 5½ months, 30, 31, three 32, three 33, two 34, 35, two 36, 40 lb. respectively.

Two lambs from each cross, 12 in all, were exhibited at the Royal Agricultural Show and afterwards sold.

Second-cross Lambs.

FROM SHROPSHIRE EWE.

Border Leicester ram .. ... 1 lamb, 4½ months, 40 lb.
Lincoln ram ... . 8 lambs, 5½ months, 30, 31, two 34, 39, two 40, 41 lb.
Romney Marsh ram .. ... 5 lambs, 5½ months, 37, 38, 39, 43, 44 lb.
English Leicester ram .. ... 8 lambs, 5½ months, 32, 33, 35, two 36, 37, 39, 46 lb

FROM SOUTHDOWN EWE.

Border Leicester ram .. ... 3 lambs, 4½ months, two 31, 35 lb.
Lincoln ram ... . 3 lambs, 5½ months, 34, 38, 39 lb.
Romney Marsh ram .. ... 7 lambs, 5½ months, 34, 36, two 37, 38, 41, 42 lb.
English Leicester ram .. ... 3 lambs, 5½ months, 34, two 40 lb.

FROM BORDER LEICESTER EWE.

Shropshire ram ... ... 2 lambs, 4½ months, 30, 38 lb.
Southdown ram ... ... 5 lambs, 5½ months, 38, two 39, 40, 45 lb.

FROM LINCOLN EWE.

Shropshire ram ... ... 6 lambs, 4½ months, two 30, 32, 33, 34, 40 lb.
Southdown ram ... ... 8 lambs, 5½ months, 31, 34, two 36, 37, 38, two 40 lb

FROM ROMNEY MARSH EWE.

Shropshire ram ... ... 1 lamb, 4½ months, 28 lb.
Southdown ram ... ... 2 lambs, 5½ months, 32, 38 lb.

FROM DORSET HORN EWE.

Southdown ram ... . 2 lambs, 5½ months, 40, 42 lb.
Border Leicester ram ... ... 1 lamb, 4½ months, 42 lb.
Romney Marsh ram ... ... 2 lambs, 5½ months, 30, 55 lb.
English Leicester ram ... ... 4 lambs, 5½ months, 35, two 37, 43 lb.

FROM CHEVIOT EWE.

Border Leicester ram ... ... 3 lambs, 4½ months, two 33, 39 lb.
Romney Marsh ram ... ... 4 lambs, 5½ months, 33, 35, two 38 lb.
English Leicester ram ... ... 1 lamb, 5½ months, 37 lb.

(For description of tegs, see page 775.)

In answer to the first question, "If the butchering and dressing of the lambs were satisfactory," the experts—Mr. H. Rawson and Messrs. Knowles and Perfect—agree that "the butchering and dressing were satisfactory throughout the parcel."

They also report that the wrapping and packing were satisfactory; but point out that care should be taken to see that in all cases the cloths are tied well up round the legs.

In reply to the question as to the condition of the first-cross lambs, the experts were of opinion that, as a whole, they were not fat enough. Some of the lambs were thin and not of a good colour. The inclusion of eight poor carcases in the Southdown ram–merino ewe lot reduced the parcel, otherwise satisfactory, by $\frac{1}{16}$th of a penny per lb. The weights as indicated in statement above, were in the case of each cross reported to be satisfactory, and in case of Southdown merino very suitable for the London trade.

"Should lambs, which are prime, but under 32 lb., be exported; and if so, what is the minimum weight which should be shipped?"

In answer to this, Mr. H. Rawson says: "Decidedly. Minimum weight, 24 lb., if prime quality. Must be absolutely prime at the weight." Messrs. Knowles and Perfect report that "the minimum

weight should be 26 lb., and only then if they are absolutely prime and well covered, as otherwise this weight would be liable to be seized on the London market for poor quality."

"If the lambs are prime, what is the maximum weight which should be sent, supposing they are over 40 lb.?"

Both experts fix the maximum weight at 42 lb. Anything over that weight will not sell as lambs. All lambs sent up to 42 lb. should be milk lambs. Carcases over 42 lb. are sold as tegs. Tegs should be of prime quality, of a maximum weight of 50 lb., and should not exceed in age six to twelve months. In placing the various first crosses in the order of their merit, taking shape, quality, and weight into consideration, Mr. Rawson puts the Southdown merino and English Leicester merino first, Lincoln merino second, Shropshire merino third, and Border Leicester merino fourth, with Romney Marsh merino nowhere. Messrs. Knowles and Perfect also bracket the Southdown merino and English Leicester merino together for first place. In the Southdown merino lot there were eight lambs not fat enough to be classed as prime, and in the English Leicester merino parcel, six. These inferior carcases were valued at 3½d. per lb., the balance at 3¾d. per lb.

As to how each of these first-cross lambs compared with New Zealand from

(*a*) Canterbury,
(*b*) Southland,
(*c*) Northland,

Messrs. Knowles and Perfect report: "Assuming that the value of Canterbury is 4½d. per lb., Southland, 4¼d. per lb., and Northland, 4d., this parcel of Shropshire merinos we should consider as worth 3½d. The quality and appearance of these lambs are not good enough to enter into competition in the London market with Canterbury."

Mr. Rawson, speaking of the same parcel, says: "Nothing like New Zealand meat," and he estimates the value as 3½d. per lb. on the same basis as Messrs. Knowles and Perfect. In the case of the Southdown merino cross, the difference in value of the primest carcases, as compared with Canterbury, is ½d. per lb. less, viz., 4d. per lb. No price is given by the experts for the Border Leicester merino cross. They could not be compared with New Zealand.

Four of the Lincoln merino cross were valued at 3¾d. per lb., and five at 3½d., by both experts.

Six of the English Leicester merino were considered to be worth 3¾d., and six one farthing less per lb.; Romney Marsh merino not valued.

Question: "Seeing unfavourable seasons at times occur in this State, causing the breeder to miss the sale of his lambs as milk-lambs, should he in that case make them prime and sell them as tegs from seven to twelve months old, at, say, 42 to 50 lb. weight, or keep them till they weigh from 55 to 65 lb.; *i.e.*, what is the difference in the price per lb. between milk-lambs, prime tegs, and prime full-weight sheep at, say, twenty to twenty-four months old?"

To this, Mr. Rawson's reply is: "I advise making lambs prime, and sending them as tegs from 42 to 50 lb. weight; they will make ⅜d. to ½d. per lb. more than sheep. Price of lambs, 4d.; tegs, 3½d.; sheep, 3d. per lb."

Messrs. Knowles and Perfect say: "In the event of missing the sale as milk-lambs, they should be made prime and sold as tegs from 42 to 46 lb. The difference in price in favour of tegs of this weight and of prime full weight sheep would be from ¼d. to ½d. per lb., and the difference in price between tegs and lambs, ¼d. to ½d. per lb. in favour of the latter.

First-cross Tegs.

Shropshire merino (7½ months), 47 lb., worth	3½d.	per lb.	(Rawson),
	3⅞d.	,,	(Knowles and Perfect).
Shropshire merino (7½ months), 45 lb., worth	3¼d.	,,	(Rawson),
	3⅜d.	,,	(Knowles and Perfect).
Southdown merino (8¼ months), 42 lb., worth	3¼d.	,,	(Rawson),
	3¼d.	,,	(Knowles and Perfect).
Border Leicester merino (7½ months), 41-49 lb.	3½d.	,,	(Rawson),
	3¼d.	,,	(Knowles and Perfect).

Lincoln merino (8½ months), 47 lb., 3¼d. per lb. (Rawson and Knowles and Perfect).

As to respective merit, both experts agree in placing the Shropshire-Merino first, Lincoln-Merino second, and Border and Leicester Merino third.

Second-cross Tegs.

Shropshire ram ...	1st cross Border Leicester ewe, 7½ months ...	43 lb.
Border Leicester ram ...	1st cross Shropshire ewe, 7½ months	46 lb.
Shropshire ram ...	1st cross English Leicester ewe, 7½ months ...	45 lb.
English Leicester ram ...	1st cross Shropshire ewe, 8½ months	41 lb.
Southdown ram ...	1st cross English Leicester ewe, 8½ months ...	42 lb.
English Leicester ram ...	1st cross Southdown ewe, 8½ months	48 lb.
English Leicester ram ...	1st cross Cheviot ewe, 8½ months	43 lb.

are each valued by both experts at 3½d. per lb., and the

Lincoln ram—1st cross Cheviot ewe, and Lincoln ram—1st cross Dorset Horn tegs of same weight (49 lb.) and age (8½ months)

at 3¼d. per lb.

In order of market worth, Southdown—1st cross English Leicester come first; English Leicester—1st cross Cheviot, second; English Leicester—1st cross Shropshire, third; and Shropshire—1st cross Border Leicester, fourth.

Mr. Rawson specially recommends the 2nd cross for tegs.

Second-cross Lambs.

Some of these lambs were considered to be fat enough, a few (Southdown–Border Leicester running 38 to 45 lb.) were too heavy, and several lots were not up to desirable weight.

Shropshire–Border Leicester and Shropshire–Romney Marsh were not of good enough quality. The Shropshire–Lincoln not satisfactory; much too plain a lamb for competition.

All the second crosses in which the Southdown ram was used were satisfactory.

Mr. Rawson considers that the second cross lambs are better than the first cross to the extent of $\frac{1}{4}$d. a lb., and more suitable for London choice Australian trade.

The Southdown ram and Dorset Horn ewe 2nd cross lambs, though slightly too heavy, possessed beautiful meat, and the lambs from Southdown ram and Border Leicester ewes were, in the opinion of the expert (Mr. Rawson), as good as Southland or Northland (New Zealand). Messrs. Knowles and Perfect confine their comments to the condition of these lambs, which they regard as satisfactory.

Border Leicester ram—Shropshire ewe, breed alright; quality not good enough; Border Leicester ram—Southdown ewe, breed alright; one prime lamb, two fair quality; weights suitable for London; Border Leicester ram—Cheviot ewe, breeding satisfactory; quality good; weights and quality suitable for London (Mr. Rawson).

The Lincoln ram—Southdown ewe lambs were regarded by Mr. Rawson as the best bred ewes, and most suitable for London. Messrs. Knowles and Perfect considered them to be satisfactory.

The lambs from English Leicester rams and Shropshire ewes were of good average quality, and the weight of them was suitable for the London trade. English Leicester on Southdown ewes were fair; on Dorset Horn ewes not quite so good as on Cheviot ewes, the lambs from which were considered to be of fair average quality.

Taking each parcel of these 2nd cross lambs as a whole, and taking into consideration shape, quality, and weight, Mr. Rawson puts them in the following order:—

Lincoln ram on	Shropshire	First.
	Southdown	
English Leicester ram on	Shropshire ...	Second.
	Southdown ...	
	Dorset Horn ...	
	Cheviot ...	
Border Leicester ram on	Shropshire .	Third.
	Southdown ...	
	Dorset Horn .	
	Cheviot .	
Southdown ram on	Border Leicester ...	Fourth.
	Lincoln	
	Dorset Horn	
Shropshire ram on	Border Leicester ...	Fifth.
	Lincoln	

Messrs. Knowles and Perfect say: "Seeing that the 2nd cross lambs as a parcel are so much better than the first cross, we had considerable difficulty in arriving at a conclusion as to which was the best lot. We have decided in favour of the lambs from Lincoln ram, Southdown ewe, age $5\frac{1}{2}$ months. These are the best lambs and most suitable for the London market. With these we have coupled the lambs from Lincoln ram and Shropshire ewe, between which there is very little to choose. As in the case of the 1st cross lambs there are

five or six lambs in these two parcels which are hardly good enough to be classed as prime, but would pass as good average quality. These we value at $3\frac{5}{8}$d. and the prime at 4d. per lb.

Compared with New Zealand lambs, and taking the price of Canterbury lambs ($4\frac{1}{2}$d. per lb.) as a standard, the Shropshire ram lots were worth $3\frac{3}{4}$d. per lb.; Southdown ram lots, as good as Southland and Northland, value $\frac{1}{4}$d. under Canterbury" (Rawson), "selling these as one lot they would be worth 4d. a lb." (Knowles and Perfect).

Border Leicester ram and Southdown ewe, one lamb $\frac{1}{4}$d. under Canterbury; two lambs $\frac{1}{2}$d. less. Border Leicester ram—Cheviot ewe, two lambs worth $\frac{1}{4}$d. and one worth $\frac{1}{2}$d. per lb. under Canterbury; Border Leicester—Shropshire, six valued at 4d., one at $3\frac{1}{2}$d. per lb. (Rawson). Messrs. Knowles and Perfect say "As a parcel these (the Border Leicester ram crosses) are worth $3\frac{7}{8}$d. per lb. The Lincoln ram lots are valued by Mr. Rawson at $4\frac{1}{16}$d. as compared with Canterbury lambs, and by Messrs. Knowles and Perfect at $4\frac{1}{8}$d. per lb. The Lincoln ram second crosses are worth $\frac{3}{8}$d. a lb. more than first cross. Messrs. Knowles and Perfect estimate the value of the same to be $4\frac{1}{8}$d. per lb.

In the English Leicester ram—Shropshire ewe lot, Mr. Rawson valued six carcases at 4d. and one carcase at $3\frac{1}{2}$d. per lb. With the Southdown ewe the English Leicester ram was not so successful, two carcases being worth only $2\frac{7}{8}$d. per lb., and one $3\frac{1}{2}$d. With the Cheviot ewe the results were equal to Shropshire, viz., 4d. a lb. Messrs. Knowles and Perfect taking the English Leicester crosses as one parcel, value the lambs at $3\frac{7}{8}$d. per lb.

General Comparison of the Second-cross with the First-cross Lambs.

Mr. Rawson reports: "Second cross lambs are better quality and more saleable than the 1st cross, making $\frac{1}{2}$d. per lb. more money. Taking the whole lot as one parcel, there are not more than from ten to twenty prime lambs. This includes both first and second cross. In fact, the whole parcel is not considered a good average specimen of Australian lambs, especially from an experimental farm."

This condition was due to the extraordinary season, and the fact that at the time these lambs were raised there was little or no good grass in the district.

On the same point Messrs. Knowles and Perfect say: "Taking the whole 126 lambs as one parcel, we find that there are only about twenty to twenty-five lambs which would be classed as absolutely prime, and which could be put on the market to be sold in competition with ordinary New Zealand or Canterbury lambs, and they gave us the impression that the lamb season has been a poor one, especially seeing that these came from an experimental farm. With regard to the question as to which parcel of lambs we consider to be the best one for the London market, we have no doubt that the 2nd cross are the best. They are the best bred lambs, and are much better in quality and shape than 1st cross, and are more full of meat. They would make from $\frac{1}{4}$d. to $\frac{1}{2}$d. per lb. more than 1st cross."

Grading.

The experts are unanimous in impressing upon shippers the necessity for grading. They say: "This is a matter which should have most careful attention. For example, 26 lb. and 42 lb. should not be in the same lot, but should be graded 26 to 36 lb. and 36 to 42 lb. This is a most important point, as, when selling lambs on the London market in big lots, either c.i.f. or *ex* London stores, they have to be sold from 26 to 36 lb., average 31; or 36 to 42 lb., average 39; and anything over or under those weights would be thrown out, and the buyer refuse to take them."

Romney Marsh Breed.

In respect to all the lambs possessing Romney Marsh blood, the experts say: "After carefully examining these lambs, we find they are very leggy, and also a bad colour; and unless they can be produced more compact and of a better colour, they are not a suitable article for the London market."

Comparison between New Zealand and Australian Lambs.

"Treating this as a general question, Australian lambs are not such a good shape and colour, nor have they the same amount of meat, as a New Zealand lamb of the same weight, *i.e.*, the proportion of bone, fat, and meat in the New Zealand lamb is more favourable to the buyer. There is a uniform standard of quality with all New Zealand lambs, which is very much missed in Australia."

The experts explain that, for the sake of simplicity, they have given the price of lamb at so much per lb. On the wholesale London meat market, sheep and lambs are sold at so much a stone of 8 lb., with a bate of 8 lb. in every five sheep, 1 lb. for every lamb. The prices for lambs ruling in London at the time of these reports were:—

New Zealand—		
Canterbury	2s. 10d. to 3s.	per stone.
Southland	2s. 8d. to 2s. 10d.	,,
Northland	2s. 8d. to 2s. 10d.	,,
Australian	2s. 4d. to 2s. 8d.	,,

Whether "Tegs" should be shipped.

In answer to the question whether the experts would advise sheep which have missed being ready as milk lambs being fully fattened and sold as "tegs" at from seven to ten or twelve months old, they strongly advise that this course should be adopted; and the report of these sent in this shipment, and their general statement with respect to the question, is very encouraging, as will be seen by the relative prices which they quote for full grown sheep, "tegs," and milk lambs, viz., sheep, 3d.; "tegs," 3½d.; and lambs, 4d. That is only ½d. to ½d. per lb. less than milk lambs, which, considering the uncertainty of our seasons, is very encouraging.

Rape as a Catch Crop.

G. L. SUTTON,
Experimentalist, Hawkesbury Agricultural College.

OWING to the terrible drought which we are now suffering from, many farmers who have sheep, and who have been unable to plant their wheat, will be casting about for some quick-growing crop which will grow through the winter and which will enable them to carry their sheep over until grass comes.

I would direct the attention of such to broad-leafed dwarf Essex Rape. Nothing is equal to this as a quick-growing sheep feed, and whilst it will not grow as rapidly if planted in the winter as it will if planted in the autumn, yet if sufficient moisture be present to germinate the seed, the plant will make root-growth during the winter and though apparently not making much headway, it will respond to the lightest shower, and in the early spring it will quickly become large enough to put sheep upon.

Every sheep farmer should make an effort to put some of this valuable crop in at once, dry though it be, for a slight shower will germinate the seed, and now that the days are short and the nights cool, it is surprising with how little moisture this plant can live.

We have had an exceptionally dry time here, yet in the first part of May we sowed rape; a few days afterwards we had 25 points of rain and now the plant is above ground, waiting for the next shower and ready to respond to it.

Many farmers are delaying their ploughing until the rain comes. To these I would urge the advisability of at once breaking the ground and bringing it to a fine tilth with harrow and roller. Upon most soils—light soils particularly—the roller is very necessary in order to compact the ground and prevent it drying through the action of the wind; but in a dry season the roller should be followed by a light harrow to prevent loss of moisture by evaporation. If the ground be made fine—and as rape is a small seed the ground should be made fine before the seed is sown—it will be found during the winter, even if no rain falls, that the soil will absorb enough moisture to germinate the seed.

Our plan at the Hawkesbury College Farm is to sow the seed in drills 3 feet apart to admit of cultivation with a horse-implement, and by this practice we have obtained, even on our poor soil, 14 tons per acre twelve weeks after sowing. For sowing it in this manner we use a maize-drill with plates containing holes of the proper size and shape; but those farmers who drill their wheat could utilise their wheat-drills for this purpose by closing some of the tubes so as to have the drills from 2 ft. to 3 ft. apart. Cultivation during a dry

time, or where the ground is dirty is especially beneficial, but where this plan is impracticable or inadmissible the seed is broadcasted or drilled. Splendid results are obtained on rich clean soil from this method, particularly if moisture be not wanting. When planted in drills for cultivation purposes, 3 lb. seed per acre is quite sufficient, but if drilled or broadcasted 6 to 10 lb. will be necessary; in both cases care must be taken not to cover the seed too deeply. The seed costs in Sydney 30s. per cwt.

Some readily *soluble* manure, as superphosphate, will in the majority of cases hasten the growth of this plant. Should the drought break and be followed by showery weather, rape will, except in the very cold districts, grow all winter and furnish an abundance of fodder in a short time. Rape is a very rich, succulent food, and stock when first turned upon it are apt to scour and also to injure themselves by over-eating; hence it is generally the custom when pasturing this crop to feed a little chaff at the same time, and to turn them on at first with a full stomach. In most districts this season this practice will be impossible, but the risk of loss will be lessened and probably obviated, if care be taken to gradually accustom the animals to the use of the new food.

Rape is one of the very best fodders we have for fattening old ewes and lambs, and at the same time it is a very desirable crop to precede wheat, for, on account of its deep-rooting properties, it brings much latent plant-food from the subsoil, and leaves it at the surface available for the shallow-rooting cereal. Rape, however, is a gross feeder, and unless grazed, or the manure returned, it will impoverish the ground where it is grown, but growing and grazing this crop will improve the soil.

In rape we therefore have a plant which is easily and quickly grown, which furnishes a valuable fodder, which is a valuable preparatory crop for cereals, and which by its power of utilising and making available the dormant fertility in the subsoil will help to lessen the fertiliser bills.

PRICKLY PEAR AS FODDER.

MR. W. R. MACBETH, of Keera, Bingara, writes:—"We find that the prickly pear, which here abounds, is of great service during this very severe drought. On it (boiled) we are feeding and fattening milch cows. Horses take readily to it, especially when a little bran or pollard is added to the boiled mass."

Rabbit Destruction.

Poisoning.

MR. O. G. RIENITS, of Mount Victoria (late of Stock Branch, Sydney), forwards the following extract from a letter received from Mr. D. L. Campbell, Ivanhoe, Trangie:—"I am sending you a photo. which was taken at one of my father's tanks not a mile from town (Trangie), where over 3,000 rabbits were poisoned in a week. The rabbits from about the tank were gathered and carted away in a dray each morning, the poisoned water being only left open in the night. This

photo. was taken on the morning following the third night when 600 rabbits were counted within 100 yards of the tank. The dray seen in the photo. has just been loaded and has 300 carcases on. It would take too long to give you full particulars, so I will just say they are poisoned at a tank with arsenic. Phosphorus was freely used by means of the poison-cart, but was not at all effective. Father has poisoned about 10,000 rabbits in a month on his different holdings."

Smothering.

In the Albury district rabbits were very numerous a few months ago, but the landowners have been successfully destroying them with phosphorised pollard distributed with poison carts. Rabbits generally take the poisoned pollard freely, especially in a very dry season like the present, and the result is that millions of the pest have succumbed to the baits; but there are others which will not take the poison, and to deal with these many expensive machines have been invented and patented for fumigating the burrows.

The simplest, however, and the most inexpensive, method that I have seen tried is to place a small quantity of dry cow-dung in the burrow, light it, and when burning freely close up all the holes to keep the smoke from escaping from the burrows, when the manure will completely burn away and will smother the rabbits.

This method is now being adopted by some of the settlers on the Upper Murray with the very best results.—E. V. FFRENCH.

Farm Notes.

RIVERINA DISTRICT.—July.

G. M. McKEOWN.

Wheat and Barley.

As the recent rainfall has been sufficient only to cause the seed to germinate and maintain growth for a short time, the crops should be rolled as soon as they are forward enough. Rolling should, however, in all cases be followed by harrowing, which may be carried out more economically by means of a very light harrow attached to the roller. It is sufficient to merely stir the surface with the harrow, so as to prevent the evaporation of the moisture which is drawn to the surface by the operation of rolling.

Sheep's Burnet.

In portions of the district, and especially in free soils, good results have been obtained from burnet. It withstands drought and responds readily to even light showers.

The land should be as deeply worked as is possible without bringing any raw soil to the surface, and should be brought into a fine condition. The seed should be sown by means of the drill, using about 10 lb. of seed. If sown broadcast, 15 lb. of seed will be required.

The crop may be lightly stocked when well grown, but at the first feeding off, sheep should not be allowed to remain long enough to eat out the crowns of the plants or injure them by trampling. As the age increases, it becomes much less liable to injury by stocking.

Lucerne.

Wherever alluvial flats are available, lucerne, even if only a small area, should be grown.

Every care should be observed in securing a thoroughly prepared seed-bed, which should be broken as deeply as possible by ploughing.

Subsoiling will greatly improve the chances of success. Where the proper implements are not available, a good substitute may be made by removing the mouldboard from an ordinary plough and following in the bottom of the furrow made by the implement which turns the surface soil. Subsoil ploughs, however, may be obtained from many of the machinery vendors.

Where sown for hay, use about 12 lb. of seed per acre; but for pasture, from 5 lb. to 8 lb. will be sufficient.

Barley

May still be sown in manured land for green fodder only.

For late sowing, the skinless variety is the best.

Vegetables.

Prepare land for spring planting of potatoes by deep ploughing and dressing with stable manure, well rolled and of fine texture.

Plant tuberous artichokes in well prepared land, which should be of the freest nature available. The sets should be placed in drills, struck out 3 feet apart, allowing about 20 inches between the sets.

Transplant cabbage and cauliflower and sow a small quantity of seed for later use.

Sow tomato seed under cover for transplantation when frosts are past.

BATHURST DISTRICT.—July.

R. W. PEACOCK.

At the time of writing, sufficient rain has not fallen to ensure germination of the cereal and other crops already sown. This means that the future yields must suffer unless a complete break-up of the drought follows, and serviceable rains fall throughout the early summer.

Wheat.

Many good crops of wheat have been reaped in this district from July sowings, but generally speaking it is too late to ensure satisfactory returns. A good many farmers who have not already sown may be obliged to sow during the month; if so, it would be wise to obtain early-maturing varieties.

Oats

Should be largely sown, and in all probability the area under this cereal will be increased, owing to farmers not being able to prepare the land for wheat earlier in the season.

Barley.

The skinless variety matures earlier than the others for grain and green fodder, and would be preferable for sowing during this month. A piece of land rich in vegetable matter at the surface should be chosen if early green stuff is required. Small paddocks where sheep have been folded are admirable for this purpose.

Rye

Can also be sown for grain and green fodder; it thrives on poorer soils than the barleys.

Peas and Tares

Can still be sown in limited quantities for pig feed and green fodder.

Vegetables.

Peas and broad beans can be largely sown during the month. Onion bulbs should be planted, and seedlings transplanted from the seed-beds. Cabbage plants should be put out, and sowings made for future planting; also, lettuce plants should be planted out and seed

sown. They can be grown to advantage between the cabbage plants, as they come off before the cabbage require all the ground. Rhubarb roots should be planted out, care being taken to dig deeply and manure the land heavily with well-rotted manure. Myatts' Linnæus has proved one of the most profitable varieties here. Asparagus beds should be well prepared for planting the roots about the middle of August; if planted too early in the winter a large percentage of roots are apt to die. The land should be trenched a couple of feet deep and well manured, as for rhubarb, and afterwards dressed with a top dressing of salt.

Tomato seed should be sown in hot frames about the end of the month for planting out early in spring. If growing only upon a small scale, they may be planted in boxes which contain about 6 inches of fresh stable manure at the bottom, covered by a few inches of soil in which to sow the seed, and mulched on top with sand or well rotted manure, to prevent the surface running together. If these are placed in a north-easterly position, under cover, and kept nicely moist, early plants may be assured.

Land should be prepared for the reception of early spring crops, such as potatoes, tomatoes, pumpkins, and melons.

The manure from the stables and cowyards should be carted on to the land whilst the teams can be spared.

Bengal Jute.

In Bengal the cultivation of Jute has had an extraordinary development during the last century.

The following are the quantities exported from Calcutta alone, and does not include the indigenous consumption:—

In 1828,	18 tons.		In 1868,	131,405	tons.
,, 1838,	3,374	,,	,, 1878,	268,113	,,
,, 1848,	11,702	,,	,, 1888,	414,192	,,
,, 1858,	45,541	,,			

The total production now is 750,000 tons per annum, and is valued at £12,000,000 to £14,000,000.

The crop covers an area of 1,750,000 acres, on which the natives grow every year a crop of rice or other cereal as well.

The price of Henequen has been as high as £56 per ton in London, and never below £22 per ton.

In the United States it has fluctuated as follows:—

April	30, 1901,	$6\frac{1}{2}$ to $6\frac{5}{8}$ cents.	=	$3\frac{1}{4}$ to $3\frac{5}{16}$	pence per lb.
June	30, ,,	$5\frac{7}{8}$ to 6 ,,	=	$2\frac{15}{16}$ to 3	,,
Nov.	30, ,,	9 to $9\frac{1}{8}$,,	=	$4\frac{1}{2}$ to $4\frac{9}{16}$	,,
Dec.	31, ,,	$8\frac{1}{2}$,,	=	$4\frac{1}{4}$	,,
Jan.	31, 1902,	$8\frac{3}{4}$ to $8\frac{7}{8}$,,	=	$4\frac{3}{8}$ to $4\frac{7}{16}$	,,

or, say lowest, £27 8s. 4d. per ton, and highest, £42 11s. 8d. in the period from April, 1901, to January, 31st, 1902.

Orchard Notes.

W. J. ALLEN.

JULY.

THE work of pruning, planting, and carting soil and manure will keep the grower's time fully occupied this month. Wherever possible, extra manuring and soiling should be given to all old and weak trees to enable them to more readily recover from the effects of the drought, which has been the cause of many trees being weakened, many of the citrus trees especially having suffered severely. Although I do not approve of pruning citrus trees until well on towards spring, still, under existing conditions, where the trees have a lot of dead branches and twigs throughout them, these might, when time permits, be removed towards the latter part of this month, in order to lessen to some extent the spring pruning, as many large growers will find that they have a big contract on hand this year to get all this dead wood removed, unless they make an early start. Of course, where the frosts are not likely to be at all severe, there is little risk in such a winter pruning; but where, on the contrary, the frosts are severe, the trees require all their surplus foliage for protection until the early spring.

The pruning of all deciduous trees may be pushed on, so that this important work will be finished in sufficient time to enable growers to give the trees their winter spraying before commencing to plough in August, it being imperative that both this pruning and spraying should be finished before the ploughing begins. Many growers keep on ploughing and scarifying their orchards all the winter; this I do not recommend. If, however, the orchard is to receive two ploughings, one should be given in the fall, and the second in the early spring. The land may be allowed to lie in its rough state all the winter, allowing the weeds to grow, which, later, may be turned under before they go to seed, or are at all dry. Where peas, tares, and other green crops are growing, it is as well to put off the spring ploughing until well on towards the latter part of August in dry districts, and early in September in moister districts, in order to obtain the largest possible crop to be turned under while there is still sufficient moisture left in the ground to thoroughly rot the crop after it has been turned in.

If the crop is left too late, it dries and hardens the ground, and when, with considerable difficulty, it has been turned under, in place of rotting and making good manure it simply dries up, and the chances are that a considerable portion of it is torn out by the cultivator. In such cases it is a question if the crop does not do more harm than good to the trees and vines.

A strict look-out for San José and other scales, aphis, &c., should be kept during the time of pruning, and all trees found to be infested with diseases of any kind should be marked, so that there will be no

difficulty in finding them later on. Such trees should then be given special treatment with mixtures found most effective in destroying the particular scale or insect affecting them.

All deciduous trees should be sprayed with lime, sulphur and salt towards the latter part of this month.

I have heard from one or two growers of trees of certain varieties which have been damaged by the application of pure kerosene, and would therefore suggest avoiding painting with pure kerosene such tender varieties and young peach and plum trees; or, if trees are painted with pure kerosene, spray the trees so treated the same day with caustic soda solution, in the proportion of 1 lb. of caustic soda diluted to 8 gallons of water.

I have to thank a few of the growers for sending me samples of their fruits, correctly named. Mr. C. H. Packham, of Clifton, Garra, has supplied me with another seedling pear raised by him, and which ripened with me on the 24th May. It had been picked from the tree about the 21st of March, and when fully ripe was an excellent dessert pear. Mr. Packham has named it "Packham's Late," and it is well worth a place in any orchard, and should be valuable for export.

Propagation of Cherry Trees.

An Armidale correspondent writes:—"I contemplate planting some 500 or 600 more cherry trees in my orchard this season. What I thought of doing was to plant out 500 or 600 suckers from the Bigarreau Napoleon, and then, in course of five or six weeks or so, graft on to the suckers; but I have been advised by some old orchardists that this is not a good idea. Still it seems to me, unless there is some disadvantage in the suckers not yet explained to me, that it would be a great saving, as the cost of 500 or 600 young trees is something, and the suckers would only cost the labour. I have not had much experience in this line, and would be glad of your advice and assistance, as I know it would be reliable."

In answer to these inquiries, Mr. Allen, Fruit Expert to the Department, says: -"Cherry or other stocks which sucker badly are usually avoided by growers, as it is an interminable contract trying to keep the ground clear of them. It is best, therefore, always to use stocks which do not throw out suckers from their roots. The Mazzard stock is generally used for strong-growing cherries, such as the Heart and Bigarreau varieties, and pits from these usually furnish good stocks for working to these and similar varieties. Rather than work on suckering stocks I would prefer losing one or two seasons, and purchase from some reliable nurseryman Mazzard stock on which to work the trees, or plant seeds and raise stocks if it is not practicable to purchase trees ready worked. My reason for advising this course is that the orchard, when once established, should last many years, and therefore it is best to have trees worked on the very best available stocks."

The same correspondent also asks for information as to the most suitable shelter trees for a district like Armidale.

Mr. W. S. Campbell advises the planting of *Pinus Halipensis* (Aleppo pine), *Pinus insignis*, and *Tamarix gallica*. Tasmanian blue-gum would probably be found useful. It grows rapidly, and soon forms a dense shelter; but eucalypts require to be planted at a greater distance from the cultivated soil than trees of the pine family.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of July.

Vegetables.

It is quite possible that before the end of June is passed good rains may fall throughout the greater part of the State, as was the case in 1900, as well as during some previous years. At the time of writing things look black enough, except in a few localities, chiefly near or about the coast, where sufficient rain for all gardening purposes has fallen from time to time, and where vegetables are plentiful in the gardens of all those who cared to grow them.

The only thing that can be done in the drought-stricken localities is to be prepared to sow or plant when rain does come at last, for it is no use whatever sowing seeds when the soil is quite dry, for they will probably perish.

Wherever the soil is sufficiently moist for sowing or planting a good deal of work can be done during the present month in the warmest parts of the State, which lie near and along the coast, chiefly to the north of Sydney. Next month, August, the weather is likely to become warmer, and in sowing seeds it would be as well to look forward to providing for kinds such as succeed best in summer, as for instance, among cabbages there is a variety known as St. John's Day, which succeeds much better in summer than probably any other kind, and those readers who have not yet grown it should obtain seed and make a trial next summer, making a sowing of seed towards the end of the month to raise young cabbages for the first summer planting.

Always endeavour to obtain the best seed of any vegetable that is procurable, even although a little extra has to be paid for it.

Asparagus.—Those who intend to plant this season had better get their ground ready in time for planting in August or early in September, according to climate. The best time to plant is when the leaf-buds show indications of starting into growth. It may be planted before that time if desired; and if plants can be procured, it might be as well to plant at the end of the month, and get the work over. There is no necessity for any elaborate preparations of the soil, beyond trenching the ground, and, if it is not rich, apply a good deal of farmyard manure when trenching.

Artichoke, Globe.—If the land for this vegetable is not in good heart it should be made so by the application of a heavy dressing of farmyard manure. The plant attains a considerable size, and produces large quantities of its flower-buds, which are used as a vegetable before the buds open. Two or three plants, if well grown, should

suffice for an ordinary family, unless the members take more than the usual fancy for this vegetable. The ground can be made ready at any time now, but the planting had better be delayed until next month.

Artichoke, Jerusalem.—This is quite different from the above, not being related to it in any way. The roots of this vegetable are used when they mature in the winter, after the plants die down. This is a splendid, wholesome, and nutritious vegetable to grow, and no vegetable garden should be without several good long rows. Before planting, make the ground rich with plenty of farmyard manure, unless it is naturally in good heart. Planting may be done now or at any time before the tubers begin to grow in the spring. Plant in rows 3 or 4 feet apart, 4 or 5 inches deep, and 12 inches or so apart in the rows.

Broad Beans.—It is rather late to sow, except in the cool climate districts, where sowings may be made during the month.

Beans, French.—In the very warmest parts of the State, near the sea, where there is little or no probability of frost, a few rows may be sown

Broccoli.—A little seed may be sown from time to time during the month in order to keep up a sufficient supply of plants. Sow but very little seed at a time, for there is no necessity to raise a great many plants which may never be required. Any young broccoli plants on hand which are large enough to move should be planted out. The soil should be well manured before planting.

Cabbage.—Sow a little seed from time to time during the month, and try two or three or more varieties, including the St. John's Day before referred to. Plant out from seed-bed any good young cabbages suitable.

Carrots.—Sow a few drills occasionally and sparingly.

Cauliflowers.—Sow a very little seed, and plant out from seed-bed. This vegetable will succeed best in the cool districts at this time of year.

Cucumber.—In warm corners or under the protection of a bell glass or glass frame some plants can be raised for planting out when there are no frosts to cut them down.

Leek.—Sow a little seed occasionally in seed-bed. Any suitable young leeks already raised can be planted out in shallow trenches made as rich as possible with good manure.

Lettuce.—Any young plants that are large enough should be planted out and some seed sown in a seed-bed, but very little for transplanting, because during the summer months the best way to grow lettuce is by sowing seed in rows where the plants are to mature, for if the ordinary method of transplanting is practised the lettuces are very liable to run to seed, and are consequently useless.

Onion.—If onions have been raised in a seed-bed for transplanting when large enough, they may be planted out during the month. This method of growing onions is an excellent one for those who grow vegetables for their own use, for seed is saved, a deal of weeding is avoided, and thinning out becomes unnecessary. Seed may be sown

if more onions are required, either in a seed-bed or in drills in the usual manner. For onions the soil should be rich, or, if not naturally so, should be well manured with, preferably rotted, farmyard manure.

Parsnip.—Sow a little seed in drills once or twice during this month.

Peas.—Sow extensively and frequently during the month in drills 3 or 4 feet apart.

Spinach.—Sow a little seed in drills about 2 feet apart, and thin out the seedlings well as soon as they are large enough.

Swede.—Sow a little seed in drills.

Tomato.—Some plants can be raised in pots or boxes, protected from frosts or cold weather at night, for planting out next month. In the warmest parts of the State tomatoes can be planted out if any young tomatoes have been raised for planting. The warmest, sunniest position in the garden should be used.

Seeds of herbs may be sown in warm localities where plants cannot be easily obtained. Herbs are of much use, and should always be grown. Parsley is one of the most useful of them all, and this must never be forgotten.

Flowers.

Before it is too late plant out any deciduous shrubs, trees, or small plants which it is intended to plant. For cold and elevated districts nothing could be better to plant for spring ornaments than the beautiful Japanese cherries. At present they are rather scarce, but can be obtained at about 2s. each. There are several varieties, single and double, but perhaps the pink or rosy double variety is the prettiest. In warmer climates the double-flowering plums and peaches are suitable, and when in full blown are very ornamental.

Roses can be planted, and the work had better not be delayed longer than can be avoided.

There are no better plants to grow than roses for general purposes, and probably no flowers afford greater pleasure to most people.

The tea-scented and hybrid tea varieties are the most useful kinds to grow, for they produce flowers almost continually, except during mid-winter, when they generally rest for a short period. Do not prune roses until just before they start into growth in the spring. In warm districts, where light frosts only are likely to occur, or where there are no frosts at all, the roses can be pruned during the month at convenience.

The early spring planting of evergreens may begin early in August, except in the cold parts of the State, and in view of this the ground had better be prepared during the month.

Seeds of hardy annuals may be sown about the garden, if plants have not yet been raised, and seeds of half hardy and even tender annuals can be sown in warm sheltered places with prospects of success. If the soil is very dry in the garden the seeds had better be sown in small beds, boxes, or pots, where it can be watered and well attended to, and the seedlings can be planted out when large enough. This will give more work, but it is the best plan to follow.

Market Review.

Board for Exports, Bridge-street,
Sydney, 14 June, 1902.

POULTRY, &c., received at the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys	Rabbits.	Hares.
1902.					pairs.	
January ...	6,266	1,677	197	372	576	....
February ..	12,593	3,416	326	297	......	....
March ...	17,228	2,087	324	846	6,502	80
April ...	25,011	4,916	257	186	9,751	896
May ...	22,605	2,382	42	440	36,828	1,800
Totals...	83,703	14,478	1,146	2,141	53,657	2,776

Besides the above, the following were received :—

1902.			
January ...	... 270	packages butchers' sundries.	58 cases eggs.
February ...	... 296	" "	53 "
March ...	... 655	" "	.
April ..	... 225	" "	...
May ...	... 218	" "	...
Totals	... 1,664	" "	111 cases eggs.

Poultry, &c., delivered from the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits.	Hares.
1902.					pairs.	
January	9,548	1,166	183	170	1,566	96
February	12,921	1,075	563	517	348	300
March	11,833	2,018	390	630	3,709	136
April	10,645	2,192	332	213	4,896	122
May	22,944	3,172	89	479	8,679	972
Totals... ...	67,891	9,623	1,557	2,009	19,198	1,626

Besides the above, the following were delivered :—

1902.			
January ...	... 609	packages butchers' sundries.	94 cases eggs.
February ...	... 262	" "	314 "
March ..	... 667	" "	536 "
April ...	... 225	" "	970 "
May ...	... 234	" "	1,250 "
Totals	... 1,997	" "	3,164 "

I AM indebted to the Collector of Customs, Sydney, for the following Return of Exports from Sydney of the undermentioned products :—

Date.	Butter.	Wheat.	Flour.	Frozen Beef.	Frozen Mutton.	Canned Meats.
1902.	lb.	bush.	tons.	qrs.	carcases.	cases.
Jan. to Feb...	1,096,536	2,269,220	3,549	8,047	181,943	57,835
March ...	148,120	308,048	1,217	13,102	49,356	30,947
April ...	205,516	177,476	2,255	3,277	41,258	17,170
May ..	104,104	4,696	1,760	2,356	50,669	27,186
Totals ...	1,554,276	2,759,440	8,781	26,782	323,226	133,138

NOTE.—The above exports of butter, wheat, and flour represent shipments to all countries; frozen beef, mutton, and canned meats do not include the Interstate or Island trade.

Some articles of New South Wales Produce or Manufacture exported during 1900.

Article.	Quantity.	Value.
		£
Bark ...	65 cwt.	26
Butter ...	10,276,594 lb.	446,102
Eggs ...	27,912 doz.	1,093
Farinaceous and milk foods ...	602 201 lb.	3,311
Fruit—Fresh ...	....	79,857
,, Boiled or in pulp...	19,510 lb.	108
Grain—		
,, Barley ...	1,892 bushels	217
,, Bran ...	721,142 ,,	26,299
,, Flour ...	796,485 ctls.	238,706
,, Maize ...	48,548 bushels	6,980
,, Maizena and cornflour ...	103,440 lb.	1,151
,, Oatmeal ...	8,775 cwt.	7,494
,, Oats...	75,704 bushels	8,121
,, Pollard ...	91,602 ,,	3,559
,, Sharps ...	142,676 ,,	7,409
,, Wheat ...	6,114,580 ,,	787,593
Honey ...	211,469 lb.	1,898
Jam, Jellies ...	1,321,411 ,,	17,787
Manures—Bone-dust ...	87,619 cwt.	20,182
,, Other kinds ...	149,145 ,,	35,574
Meats—Bacon and Hams ...	549,637 lb.	16,246
,, Extract of Meat...	6,346 ,,	965
,, Frozen ...	513,601 cwt.	584,738
,, Preserved (tinned) ...	12,398,011 lb.	260,455
,, All other kinds ...	....	43,683
Milk—Condensed, concentrated, and preserved ...	185,664 lb.	2,354
Timber—Doors ...	45 No.	44
,, Dressed...	1,404,741 sup. feet	8,849
,, Rough ...	12,030,116 ,,	76,124
,, Shooks and staves ...	....	3,560
,, Houses ...	11 No.	2,188

Some articles of New South Wales Produce or Manufacture exported during 1900—*continued.*

Article.	Quantity.	Value.
		£
Timber—Piles	2,743 ,,	8,457
,, Posts and rails	903 ,,	53
,, Railway sleepers	192,728 ,,	38,846
,, Wood-paving blocks	318,560	2,344
Wool—Greasy	236,067,538 lb.	7,051,564
,, Scoured and washed	37,073,481 ,,	1,983,873
Hay and chaff	143,948 cwt.	21,166
Potatoes	22,927 ,,	5,717
Onions	5,005 ,,	1,233
Cheese	399,134 lb.	9,349

Some articles of New South Wales Produce or Manufacture exported during 1901.

Article.	Quantity.	Value.
		£
Bark	65 cwt.	26
Butter	10,352,816 lb.	449,640
Eggs	41,135 doz.	1,609
Farinaceous and milk foods	627,248 lb.	4,134
Fruit—Fresh	....	96,694
,, Boiled or in pulp	99,928 lb.	703
Grain—		
Barley	5,343 bushels	612
Bran	725,667 ,,	26,484
Flour	835,994 ctls.	255,485
Maize	57,362 bushels	8,255
Maizena and cornflour	116,310 lb.	1,323
Oatmeal	9,066 cwt.	7,824
Oats	239,058 bushels	28,082
Pollard	90,602 ,,	3,559
Sharps	142,676 ,,	7,409
Wheat	6,114,580 ,,	787,593
Honey	211,653 lb.	1,902
Jam, Jellies	1,513,888 ,,	21,279
Manures – Bone-dust	87,619 cwt.	20,182
,, Other kinds	162,040 ,,	39,104
Meats—Bacon and Ham	601,914 lb.	18,033
,, Extract Meat	22,732 ,,	2,876
,, Frozen	513,613 cwt.	584,762
,, Preserved (tinned, &c.)	13,379,176 lb.	280,908
,, All other kinds	....	50,460
Milk—Condensed, concentrated, and preserved	525,526 lb.	8,323
Timber—Doors	6,642 No.	2,809
,, Dressed	1,586,976 sup. feet	10,357
,, Rough	13,376,193 ,,	85,289
,, Shooks and staves	....	11,381
,, Houses	11 No.	2,188
,, Piles	2,943 ,,	8,617
,, Posts and rails	903 ,,	53
,, Railway sleepers	192,728 ,,	38,846
,, Wood-paving blocks	318,560 ,,	2,344
Wool—Greasy	245,074,758 lb.	7,325,868
,, Scoured and washed	40,101,747 ,,	2,141,386
Hay and chaff	156,224 cwt.	23,634
Potatoes	207,763 ,,	62,068
Onions	40,179 ,,	17,432
Cheese	489,618 lb.	11,700

TABLE from the Board of Trade Returns showing the total quantity of Butter imported into the United Kingdom in the month of March, 1900, 1901, 1902, and for three months ended 31st March, 1900, 1901, 1902:—

Butter.

Country.	Month ended 31st March.			3 months ended 31st March		
	1900.	1901.	1902.	1900.	1901.	1902.
Colonies—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Canada	17	236	1,860	1,860	398	7,223
New South Wales ...	10,261	12,952	1,043	51,876	38,445	14,303
New Zealand	21,223	44,724	20,967	87,105	97,461	106,608
Queensland	....	.....	.....	1,545	. . .	......
Victoria...	30,156	27,432	431	146,771	123,425	61,408
Total	61,657	85,344	24,301	289,157	259,729	189,542
Foreign Countries—						
Denmark	120,586	133,758	134,031	364,058	372,086	419,301
France	23,492	20,914	21,662	69,744	65,083	67,564
Germany	7,391	5,864	4,696	23,787	17,435	18,643
Holland...	16,561	19,638	17,853	49,620	55,507	53,185
Russia	8,691	15,896	24,228	23,492	32,293	51,521
Sweden	15,738	14,001	14,920	51,083	49,011	48,314
United States	360	18,683	4,716	3,733	57,717	28,001
Other Countries ..	16,645	15,903	16,101	51,823	45,304	53,676
Total	209,404	244,657	238,207	637,340	694,431	740,205
Grand Total	271,061	330,001	262,508	926,497	954,160	929,747

TABLE from the Board of Trade Returns showing the quantity of Butter imported monthly into the United Kingdom from the Colonies and Foreign Countries.

Butter.

Date.	Colonies.				Foreign Countries.		
	Australia.	Canada.	New Zealand.	Total.	Denmark.	France.	Germany.
1902.	cwt	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
January ..	53,796	4,065	44,593	102,454	148,678	23,977	6,396
February ...	20,441	1,298	41,048	62,787	136,592	21,925	7,551
March . .	1,474	1,860	20,967	24,301	134,031	21,662	4,696
Total .	75,711	7,223	106,608	189,542	419,301	67,564	18,643

Date.	Foreign Countries—*continued.*						Grand Total.
	Holland.	Russia.	Sweden.	United States.	Other Countries	Total.	
1902.	cwt.	cwt	cwt.	cwt.	cwt.	cwt.	cwt.
January . .	19,575	11,205	19,013	9,584	17,757	256,185	358,639
February .	15,757	16,088	14,381	13,701	19,818	245,813	308,600
March ...	17,853	24,228	14,920	4,716	16,101	238,207	262,508
Total ...	53,185	51,521	48,314	28,001	53,676	740,205	929,747

TABLE from the Board of Trade Returns showing the total quantity of Cheese imported into the United Kingdom in the month of March, and for three months ended 31st March, 1900, 1901, 1902.

Cheese.

Country.	Month ended 31st March.			3 months ended 31st March		
	1900.	1901.	1902	1900.	1901.	1902.
Colonies—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Australia ... }	12,338	1	1	33,310	145	1
New Zealand ... }		21,946	7,502		40,254	23,749
Canada	25,033	50,229	41,147	71,509	118,098	114,750
Total	37,431	72,176	48,650	104,819	158,497	138,500
Foreign Countries—						
France	3,292	1,922	3,699	9,307	5,179	14,842
Holland	24,509	22,675	18,848	77,471	80,266	61,037
United States	73,906	42,941	53,995	224,950	142,576	146,458
Other Countries ...	5,509	6,354	4,191	11,236	18,031	9,914
Total	107,215	73,892	80,733	322,964	246,052	232,251
Grand Total	144,647	146,068	129,383	427,783	404,549	370,751

TABLE from the Board of Trade Returns showing the quantity of Cheese imported monthly into the United Kingdom from the Colonies and Foreign Countries.

Cheese.

Date.	Colonies.				Foreign Countries.					Grand Total.
	Australia.	Canada.	New Zealand.	Total.	France.	Holland.	United States.	Other Countries.	Total.	
1902.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Jan. ...	...	32,907	7,336	40,243	4,803	19,927	65,972	3,864	94,566	134,809
Feb. ...	...	40,696	8,911	49,607	6,340	22,262	26,491	1,859	56,952	106,559
Mar. ...	1	41,147	7,502	48,650	3,699	18,848	53,995	4,191	80,733	129,383
Total..	1	114,750	23,749	138,500	14,842	61,037	146,458	9,914	232,251	370,751

MESSRS. W. WEDDEL & Co., London, in report dated April 25, 1902, say :—

The Copenhagen official quotation, after remaining at 96 kroner for seven weeks, has been lowered to 92, which is 4 kroner higher than it was last year. The market in Manchester last Tuesday was affected by sentiment rather than large supplies, and, owing to retailers abstaining as much as possible from buying, values fell 2s. @ 3s. per cwt. Russian butter is very short this week, as the steamer from Riga—the first vessel this season from that port—will not arrive before early next week. Supplies of all kinds of Continental butter will now increase week by week, and early shipments of Canadian are coming along. In America, butter continues excessively dear, "choicest" quality making 150s. per cwt., even process butter there is selling at 120s. @ 130s.

The Butter Standard.—Mr. Hanbury, the Minister for Agriculture, has over-ridden the practical and reasonable recommendation of his own departmental Committee, and has issued the following regulations with regard to the sale of butter :—"Where the proportion of water in a sample of butter exceeds 16 per cent., it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the butter is not genuine by reason of the excessive amount of water therein." The regulations extend to Great Britain, and will come into operation on the 15th day of May, 1902. It will be noticed that Ireland is exempt from these regulations. If Mr. Hanbury would exercise his energies by teaching the British farmer how to make butter as suitable for the British market as that made by the foreigner and the British colonist, he would be doing the farmers far better service than by trying to build a protective wall around them to shelter them from the evils of their own incapacity. The laws for suppressing fraud should be framed so as to fall with severity on the person committing the fraud, and not attempt to suppress the manufacture of "milk blended butter," which, on its merits, as alleged by the farmers themselves, is beating them for quality and price in their own markets. If half-a-dozen persons were sent to prison for three months for selling adulterated butter, frauds of this character would soon cease. The fixing of a standard for water in butter is puerile, will do no good, but on the contrary, will bring much trouble to the Department of Agriculture.

Cheese.—The demand for Canadian and New Zealand cheese continues steady, and prices have advanced another shilling per cwt. this week, the top quotation for Canadian being 58s., while New Zealand is only a shilling less. It looks as if 60s. would be reached shortly.

Messrs. Mathie and McWilliam, Glasgow, writing on 8th May, 1902, say :—

After a continued period of steady demand for butter, the markets all over have been in a state of comparative collapse these past two weeks.

For seven weeks in succession Copenhagen Official Quotation remained unchanged, but for last week's arrival a fall of 4 kroners was marked, and for this week' sarrival a further drop of 2 kroners took place, bringing down the quotation to within 2 kroners of the corresponding period of last year. Notwithstanding the reduction in values the sales of Danish has been very dull and irregular, and arrivals have not been well cleared. To-day's Official Quotation is "unaltered," and this may help to steady the market.

Large supplies of Russian and Siberian butter are now coming forward, the quality of which is generally showing an improvement on last season's makes. Owing to the extremely heavy arrivals last week (about 25,000 cwt.) there was a sharp slump in prices, finest being obtainable at 96s. per cwt.; and as this price is well suited for the popular 1s. retail cut, considerable attention is consequently given to these goods. This year will witness an extension of the Siberian dairy industry, the output being estimated at, at least, 30 per cent. over that of 1901.

Friesland and Dutch butters are now coming forward in largely increased quantity, and of exceptionally fine quality; and as choicest Friesland butter is this week obtainable at 97s. to 98s., per cwt., it is naturally proving attractive to buyers.

The arrivals of Argentine butter show an increase this season and are rapidly absorbed as they come forward.

Supplies of New Zealand butter are very small and prices easier, in sympathy with other sorts; this week's arrival, per "Gothic," will practically finish the season.

Presently the supply from Canada and the United States is nil.

In a report published by the U.S. Department of Agriculture, Washington, mention is made of the manufacture of corn-oil and corn-oil cake.

Corn-oil and corn-oil cake are by-products from the manufacture of corn into glucose and grape sugar. The oil is of a reddish-yellow colour, and of pleasant taste. It is used in the manufacture of paints, leather dressing, various kinds of soap, and rubber substitute. Corn-oil cake, the residue after expressing the oil, is valuable as an animal food, especially for dairy cattle.

A considerable foreign demand has sprung up recently for both these products. Exports of corn-oil have increased from 2,646,560 gallons in 1898, when this oil was first separately specified in statements of exports, to 4,808,545 gallons in 1901. Estimated by values, the increase during the period has been from $576,646 to $1,831,980. These exports have been directed almost exclusively to Europe, Belgium taking steadily about one-half the total. Exports of corn oil cake increased from 2,202,680 lb., valued at $20,286, in 1898, to 4,888,776 lb. in 1900, valued at $48,783. France is the principal purchaser of this product.

Only the germs of corn are used in oil extraction, these being separated from the rest of the grain by mechanical process. They are ground into a powdery meal, heated, and the oil expressed by a process similar to that of expressing linseed oil from flaxseed. The residue of the corn, after separating the germs, is utilised in the manufacture of a starch from which, in turn, is derived a great variety of products, such as special starches, dextrines, gums, glucose, and grape sugars.

Breadstuffs markets continue at the late range of prices, though the recent rains caused a slight tendency to ease the price of wheat. Wholesale Sydney quotations to date are as follows—

Flour—City roller, £9 10s.; other grades, £9; Manitoba, £12 per ton
Wheat—To 4s. 5d. per bushel.
Bran and Pollard, 1s. 3½d. per bushel.
Oats—Local prime seed, 3s. 6d.; prime feed, 3s. 4d.; Algerian, 3s. 5d. per bushel.
Barley—Cape, 4s. 1d.; English, 4s. per bushel.
Maize—Prime, to 4s 9d. per bushel.
Lucerne—Fresh dry green, £7 5s. per ton.
Oaten Hay—Prime local, £6 15s. per ton.
Chaff—£5 15s. to £6 per ton.
Straw—Local bundles, £3 15s. per ton.
Potatoes—Prime Tasmanian, to £5 10s. per ton.
Onions—Victorian, £7 10s.; New Zealand, £7 per ton.
Turnips—Prime, £4 10s. per ton.

Peas—Prime blue, to 7s.; grey, to 4s. 7d. per bushel.
Butter—Pasteurised, 1s. 6½d.; factory, 1s. 5½d. per lb.
Cheese—Loaf, 7½d.; Kameruka cheddar, 8½d. per lb.
Bacon—Sides, 7¾d.; flitches, 7d.; middles, 8d. per lb.
Hams—Colonial, in cloth, 10d. per lb.
Eggs—1s. 6d. to 1s. 8d. per dozen.
Poultry—Prime hens, 3s.; young roosters, 3s. 3d.; ducks, 3s.; geese, 5s.; turkeys, 4s. 6d.; gobblers, 8s. per pair.
Rabbits—Large, to 7s. per dozen pair.
Hares—10d. to 1s. 4d. per pair.
Honey—3d. to 3½d. for prime per lb.
Oranges—Prime, 8s.; medium, 6s.; rough, 2s. per case.
Lemons—Prime, 8s.; medium, 6s.; rough, 2s. 6d. per gin-case.
Passion-fruit—6s. 6d. per half-case.
Pineapples—Cayennes, 10s.; prime common, 9s.
Bananas.—To 6s. per bunch; 10s. 6d. per case.

H. V. JACKSON,
Secretary, Board of Exports.

Probable Occurrence of the Tapeworm (*Taenia ovilla*) in Australian Sheep.

Mr. P. P. Monighan, of Nirriga, beyond Nowra, in the Goulburn district sent some segments of a tapeworm that he said were from the dung of sheep. On examination it was found by Dr. Cobb that the segments displayed the character of presenting at the anterior fracture minute granules that were easily broken loose in the methylated spirit in which they were preserved. On examination under the microscope these proved to be small sacks, each containing from four to a dozen typical tapeworm eggs, in some of which rather faint traces of six hooklets were to be seen.

The posterior margin of the segments was entire. There was one genital pore to each segment. The segments occurred singly but were so few in number that little importance can be attached to this feature. As to measurements, much must be allowed for the contractility of such segments when placed in spirit as these had been. Each segment measured 3 millimetres in width and was about four times as wide as long, and about as thick as long. Anteriorly the segments were wider than posteriorly, where the margins were in contact, so as to give to the cross-section parallel to the former body axis a somewhat triangular form.

The sacklike receptacles measured about 80 mm., and the contained subspherical eggs were about 20 mm. in diameter.

These facts appear sufficient to lead to the belief that we have here to do with the worm *Taenia ovilla*, Rivolta—a worm, I believe, not hitherto noted as belonging to our fauna.

AGRICULTURAL SOCIETIES' SHOWS, 1902.

Society.	Secretary.	Date.
Dapto A. and H. Society ...	A. B. Chippindall	Jan. 8, 9
Albion Park A. and H. Association	W. J. Ziems ...	,, 15, 16
Kiama A. and H. Society ...	James Somerville	,, 25, 27
Wollongong A., H., and I. Association ...	J. A. Beatson ..	Jan. 30, 31, Feb. 1
Berry Agricultural Association	A. J. Colley ...	Feb. 6, 7
Lithgow A., H., and P. Society ...	M. Ashe	,, 12, 13
Manning River A. and H. Association (Taree)	S. Whitbread ...	,, 13, 14
Alstonville Agricultural Society ...	Henry R. Elvery	,, 18, 19
Moruya A. and P. Society	J. Jeffery ...	,, 19, 20
Candelo A. Association	C. H. Brooks ...	,, 26, 27
Ulladulla A. and H. Association ...	C. A. Cork ...	,, 26, 27
Tumut A. and P. Association	Bland Clayton ...	,, 26, 27
Robertson A. and H. Society	R. G. Ferguson...	,, 27, 28
Port Macquarie and Hastings District A. and H. Soc....	J. Y. Butler ...	,, 27, 28
Braidwood P. and A. Society	G. F. Taylor ...	March 4, 5
Campbelltown A., H., and I. Society	A. R. Payten ...	,, 4, 5,
Tenterfield Intercolonial P., A., and M. Society	E. W. Hosking ..	,, 4, 5, 6 Sale days 7, 8
Cobargo A., P., and H. Society ...	Thos. Kennedy. .	March 5, 6
Berrima District (Moss Vale)	J. Yeo	,, 6, 7, 8
Bangalow A. and I. Society	G. Noble ...	,, 11, 12
Queanbeyan P. and A. Association	A. W. Moriarty...	,, 11, 12
Glen Innes and Central New England Combined District Show ...	George A. Priest	,, 11, 12, 13
Castle Hill and District A. and H. Association ...	Frank H.G. Rogers	,, 12, 13
Bega A., P., and H. Society	J. Underhill ...	,, 12, 13
Nepean District P. and A. Society (Penrith) ...	E. K. Waldron...	,, 12, 13, 14
Oberon A., H., and P. Association	W. Menehan ...	,, 13, 14
Goulburn A., P., and H. Society ...	J. J. Roberts ..	,, 13, 14, 15
Gulgong A. and P. Association ...	J. E. Hilton ...	,, 14, 15
Gulgong A. and P. Association ...	C. E. Hilton ...	,, 14, 15
Walcha P. and A. Society ...	F. Townshend ...	,, 18, 19
Blayney A. and P. Association ...	H. R. Woolley ...	,, 18, 19
Bombala Exhibition Society	R. N. Cook ...	,, 18, 19, 20
Cumnock P., A., and H. Association	W. L. Ross ...	,, 19
Cooma P. and A. Association	Chas. J. Walmsley	,, 19, 20
Upper Hunter P. and A. Association (Muswellbrook)...	Pierce Healy ...	,, 19, 20, 21
Inverell P. and A. Association	T. P. Borthwick ..	,, 19, 20, 21
Camden A., H., and I. Society ...	C. A. Thompson...	,, 19, 20, 21
Macleay A., H., and I. Association (Kempsey)	E. Weeks ...	,, 19, 20, 21
Crookwell A., P., and H. Society	M. P. Levy ...	,, 20, 21
Gundagai P., A., H., and I. Association	A. Elworthy ...	,, 20, 21
Central Richmond River (Coraki) A. Society ...	D. Cameron ...	,, 20, 21
Mudgee A. Society ...	J. M. Cox ...	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 25, 26, 27
Royal Agricultural Society of N.S.W. ...	F. Webster ...	,, 26–Ap. 2
Durham A. and H. Association (Dungog) ...	Chas. E. Grant...	April 9, 10
Quirindi District P., A., and H. Association ...	Geo. Haughton...	,, 9, 10

Society.	Secretary.	Date.
Bathurst A., H., and P. Association	W. G. Thompson	April 9, 10, 11
Hunter River A. and H. Association, West Maitland...	W. C. Quinton	Apr. 15, 16, 17, 18
Liverpool Plains (Tamworth) P., A., and H. Association	J. R. Wood ...	April 16, 17
Lismore Agricultural and Industrial Society	T. M. Hewitt ..	" 16, 17
Orange A. and P. Association	W. Tanner ...	" 16, 17, 18
Namoi P., A., and H. Association (Narrabri)	J. McCutcheon ...	Postponed.
Wellington P., A., and H. Association	Jas. Thompson, jr.	Apr. 23, 24, 25
Richmond River A., H., and P. Society (Casino) ...	J. T. Tandy ...	" 24, 25
Warialda P., A., and H. Society	W. B. Geddes ..	" 30–May 1
Lower Clarence Agricultural Society (Maclean) ...	Geo. Davis ...	" 30 " 1
Newcastle and District A., H., and I. Association ...	M. A. Fraser ...	May 2, 3
Clarence P. and A. Society (Grafton)	Jas. C. Wilcox ...	" 6, 7
Moree P. and A. Society		Indefinitely postponed.
Nyngan and District P. and A. Association	R. E. Burns ...	May 13, 14
Upper Manning A. and H. Association (Wingham)...	W. Dimond ...	" 14, 15
Hawkesbury District A. Association	C. S. Guest ...	" 15, 16, 17
Coonamble P. and A. Association	F. C. Lamoth ...	July 16, 17
Deniliquin P. and A. Society	Louis Harrison ...	" 17, 18
Hay P. and A. Association	G. S. Camden ...	" 23, 24
Urana P. and A. Society	J. Wise	" 23, 24
Riverina P. and A. Association	W. Elliott ...	" 29, 30
Condobolin P. and A. Association	D. H. Tasker ...	" 30, 31
Gunnedah P., A., and H. Association	J. H. King ...	Postponed.
Balranald P. and A. Society	C. S. Bainbridge..	Postponed.
Narrandera P. and A. Association	J. T. Williams ...	Aug. 6, 7
Forbes P., A., and H. Association	N. A. Read ...	" 6, 7
Corowa P., A., and H. Society	E. L. Archer ...	" 12, 13
Parkes P., A., and H. Association	G. V. Scabron ...	" 13, 14
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. A. Shorter	" 20, 21
Grenfell P. and A. Association	Geo. Cousins .	" 27, 28
Northern Agricultural Association	C. Poppenhagen..	" 27, 28, 29
Cootamundra A., P., and H. Association	T. Williams ...	" 27, 28
Junee P., A., and I. Association	G. W. Scrivener..	Sept. 3, 4
Murrumburrah P., A., and I. Association	J. A. Foley ...	" 3, 4
Young P. and A. Association	C. H. Ellerman...	" 9, 10
Manildra P. and A. Association (Exhibition and Ploughing Matches)	G. W. Griffith ...	" 10
Albury and Border P., A., and H. Association ...	W. J. Johnson ...	" 10, 11
Yass P. and A. Society	W. Thomson ...	" 11, 12
Berrigan A. and H. Society	G. Hamilton ...	" 17
Germanton P., A., and H. Society	G. T. S. Wilson...	" 17, 18
Burrowa P., A., and H. Association	John N. Clifton...	" 18, 19
Temora A. and P. Society...	W. H. Tubman...	" 23, 24
Wentworth P., A., and I. Society	Jas. W. Thorn ...	Oct. ...

1903.

Ulladulla A. and H. Association (Milton)	C. A. Cork ...	Feb. 18, 19
Inverell P. and A. Society...	T. P. Borthwick..	Mar. 18, 19, 20

[7 plates.]

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Milk and Cream.

M. A. O'CALLAGHAN.

Milking.

AFTER what has been said in previous articles regarding the many injurious bacterial fermentations to which milk and its products are subject, the farmer should readily understand the necessity for absolute cleanliness in all the processes relating to the manufacture of dairy products.

The control which the butter-maker or cheese-maker will be able to exercise over the fermentations which he has to deal with will depend on how the the farmer does his portion of the work, and there is no point in connection with the whole of dairying which requires more care than that of milking.

Before milking commences the cow-bails or the cow-byre should be in a state of cleanliness as well as in a state of rest; no matter how cleanly we may be, or how much a farmer may endeavour towards keeping his cow-bails clean, it will be impossible for him to prevent to a certain extent what might be termed a bacterially contaminated atmosphere, and any disturbance in the cow-bails which will cause further dust to be driven from the floor of the bails into that atmosphere will have an injurious effect; these particles of dust will, before the process of milking has ceased, have gravitated into the milking pails, and in due time will set up the fermentations peculiar to their species.

Hence necessity for quiet, outside of the fact, of course, that any undue disturbance will upset the nervous temperament of the cows, resulting in a decreased milk flow, and in a decreased fat percentage.

The next item to attend to is to see that the cows themselves are clean, more particularly the lower portions of the body, because any loose dust or dirt that are on these portions is, by the process of milking, liable to be shaken from the cow's body into the milk-pail. Thus the necessity for washing or damping the cow's udder and flanks. If the udder is not washed, it should be at least damped with a clean cloth, the reason for this being that just as the sprinkling by the watering cart prevents the dust from rising in the streets, so will the damping of the dust on the cow's body prevent a great portion of it from falling into the milk-pail during milking. When cows are being housed, as they sometimes are in winter, the hindquarters and tail frequently become very dirty. In such cases, it is absolutely necessary that the cattle should be cleaned and groomed before milking, and many good dairy farmers in the older world, where cattle have to be housed during the winter months, adopt the practice of clipping the tail and udder so as to prevent the deposit of much dirt on those parts.

The next step is the cleanliness of the milker himself or herself, as the case may be. There is very little use in cleansing the cow if the

milker is to remain dirty. His clothes, as well as his hands, should be clean, and he should wash his hands frequently during milking, especially if he has milked a cow with a dirty udder, or a cow that has any skin eruptions on the udder. In this latter case he should have recourse to some means of disinfecting his hands before proceeding to milk another cow, and perhaps the simplest form of disinfectant for him to employ would be a 5 per cent. solution, in water, of carbolic acid. I have seen the very old and very dirty practice of the milker dipping his fingers into the milk-pail so as to damp the cow's teats during milking. Now there is no more disgusting, and no more injurious practice in the whole of dairying. Of course, a milker cannot keep his hands perfectly dry, because the friction would be too great, and the cow would be irritated, but if the hands are to be slightly moistened, it should be done with water, or in case of a cow having sore teats, with vaseline.

We will take it then that everything is clean and ready for milking, the only point worthy of note in the laying down of any rules for the technical part of the milking is to see that the animal is milked quickly and thoroughly; if there is undue delay the cow becomes excited, and will not yield all her milk, also nothing makes what is known as a "tough" cow so readily as this slow, tedious milking, and, for this reason, amateurs or students should never be allowed to milk cows in full flow. They should be given their practice on what are known as "strippers." The cow should be at all times milked out clean. In fact, it is a practice in most large dairies in Europe to have one person who supervises the milking deputed to also do the stripping. This ensures two things, viz., that the last portion of the milk which is by far the richest is obtained, and also that the cow is being developed on proper lines towards becoming a persistent and continuous milker. Nothing causes a cow to go dry so quickly as allowing a small portion of the milk to remain in the udder at each milking, and nothing ruins a young cow so readily as this same practice. If a cow is to be developed into what might be termed a high-class milking machine, it is absolutely necessary that when she comes to dairy at first she should have the best and most careful milking, and the last streams of milk should be patiently drawn at the end of each milking.

The Treatment of the Milk.

Whether the milk is to be used for butter-making or cheese-making, for condensing, or for sale to supply towns or cities, it should immediately after it is drawn from the cow be passed through a strainer, so as to at once remove, as far as possible, the hairs and fine particles of dust that will get into milk even with the most careful milker. When it is borne in mind that these hairs, particles of dust, or flies, all carry with them micro-organisms that are very likely to be of an injurious nature, it will be seen that the sooner these bodies are removed from the milk the better.

The next step should be the cooling and aerating, or in places where cold water is not available, the aerating should be done independent of

the question of cooling. There is no part of Australian dairying that is so much neglected as this. Very few farmers ever trouble to cool or aerate their milk. This is strange when we consider that there is no part of the world where the operation is so necessary as in this country. The reason for this has already been pointed out, when dealing with the question of milk fermentations. Farmers will tell you if you ask them to cool their milk, that they cannot get cold water, but it must be remembered that the milk when it leaves the cow's udder is at a temperature of about 100°F, and also that there are few—if any—dairy districts in Australia where water cannot be procured in summer at a temperature of not more than 75°F., and if farmers could only understand the result on the bacterial development in milk caused by an immediate reduction in temperature of 25°F., they would, if they had the interest of the industry at all at heart, do all in their power to reduce the temperature as low as possible while it is being held before separating, and especially when the milk is separated only once a day. This brings about another question, and that is the practice adopted by some farmers of using what are called preservatives for the purpose of preventing their milk becoming sour before it is separated. This practice should at all times be discouraged. At best it is only the lazy man's remedy to hide the effects of his dirty and careless ways.

Separating.

The next step in the process of butter-making is the separation of the cream from the milk, and dairying has now reached a stage when it is unnecessary to discuss any method of doing this save that of separation by centrifugal force or by what is known as the cream separator. All other methods of separation result in too great a loss of butter-fat in the skim milk to make them commercially speaking worth considering. And now arises the question on which more variety is observed than on any other process of dairying, viz., that of the temperature at which milk should be separated. Some years ago it was a common belief that when milk was heated to a temperature of over 80°F. it had an injurious effect on the butter produced. With the advent of pasteurisation this idea was exploded, and it is now a well-known fact that milk may be heated to even 195°F. without causing any lasting injurious effect on the resulting butter. Hence the operator need never be afraid that he is separating his milk at too high a temperature provided he cools the cream at once. Without going into the fine points of why milk will separate more easily at a high than at a low temperature, we might explain that the higher the temperature the less friction occurs when the particles of fat are being driven to the surface in the form of cream, and we can readily understand that the smaller the resistance that is offered to their coming to the surface the more readily will the cream be separated from the milk. It is then a safe rule to lay down: Separate milk at the temperature at which it leaves the cow's udder, viz., at 100°F. If we pasteurise the milk we can separate it at a temperature of 180°F., but we should never attempt to separate milk at a temperature lower than 90°F. if we wish the separator to do its best work. The milk if

separated on the premises of the farmer had better be passed through the machine as soon as possible after it has been milked, in fact there is no reason why the separating and the milking should not go on at the same time. If this is done it will save the farmer the necessity of heating his milk afterwards for purposes of complete separation. The milk should be strained as it enters the separator, and the separator should be run at a uniform speed throughout the entire process; also the supply of milk to the separator should be uniform while the separation proceeds. If the inflow of milk to the separator is irregular the cream will be also of an irregular consistency at those intervals, and the farmer may be surprised to find that where he had 10 gallons of cream yesterday he has but 8 to-day, still, if the separator has been doing good work, he will have as much butter-fat in the 8 gallons of cream as he had the day before in the 10 gallons. Another matter requiring attention is to see that not alone is the speed of the machine uniform, but that it is at what is termed full speed. If a machine is guaranteed to do a certain amount of milk per hour when revolving at the rate of 6,000 revolutions per minute, it will not do anything like the same work efficiently if the speed becomes at intervals reduced to (say) 5,000 per minute. This question of speed brings attention to two or three other small points, namely, the necessity for keeping plenty of steam in the boiler; and where an engine is used, the shafting running at a uniformly high rate, and also seeing that the belts of the machinery are taut, because if the belts of either the separators or the engine are loose there will be a considerable diminution in the speed of the separator, even though the engine may be running at its proper rate. The oiling of the machine requires attention both before and during the process of separating; the oil-cups should never be allowed to become empty, and the operator should see that the oil is being constantly transferred from the cups to the bearings (none but the very best oil should be used), otherwise the bearings will become hot, and the machine may be practically ruined.

One other point that has an influence on the separation of cream is the condition of the milk. If milk is even slightly sour it will not separate with the same facility as sweet milk, the result being a considerable loss in butter-fat, and frequently a separator clogged with slime.

The Treatment of Cream for Butter-making.

When cream leaves the separator, all future treatment should be of a character which will enable the butter-maker to turn out an article not only of fine flavour, but one which will retain its good qualities for a considerable length of time. When we remember that Australian butter will scarcely reach the consumer in England until it is at least two months old, it will be plainly evident that if we are to deliver it on the table in England in a condition which will do the State credit, every care possible must be taken in its handling and treatment before it is made into butter. It is a very old saying that, given good cream, anybody can make good butter; but no matter how skilful and how

careful the butter-maker may be, he cannot manufacture a high-class butter from cream that has not been properly treated during the process of ripening. Ripening means allowing the cream to become so acid that it will yield up its butter-fat easily, and also that it shall be sufficiently ripe to have the characteristic flavour of butter which has been made from what is known as ripe cream.

The Ripening.

Immediately the cream leaves the separator it should pass over a cooler, so that it may be cooled down to a suitable temperature for ripening purposes, viz., about 65° F. This temperature will not be possible in the average separating station in Australia, because our separating stations very rarely contain refrigerating machinery, and the temperature of the water obtainable in this country during the summer months is, as a rule, considerably above 65° F. As, however, every degree of temperature counts, the aim should be to reduce the temperature as much as possible, even though we cannot get it, perhaps, below 75° F. Many separating stations and farmers working their own separators never take the trouble to cool their cream in any way whatever, but simply let it run from the separator into a can, where it remains until it is despatched to the factory. Sometimes the can containing this cream is placed under the separator again next morning, and a second day's separating run in on the first cream, and as frequently as not the two creams are never stirred, the result being that when the cream ultimately reaches the factory the can contains two layers of cream of different ages, and of different qualities and degrees of ripeness. Needless to say this practice is to be completely condemned. With every separator sent out from the store should also be sent a cream-cooler, the circular type being, in my opinion, the most suitable. The cost of supplying a cooler with a hand separator will only be a couple of pounds extra, but the result, if it is intelligently used, should make more than that difference to the factory in one month; not to mention the risk of having this inferior cream getting mixed with good creams, and ruining, perhaps, the full output of the factory for that day. It is not easy to lay down strict rules for Australian dairying as it is carried on at present, because so many of our farmers separate their own cream, all working under different conditions, and with different degrees of knowledge, and frequently with different appliances. The following rules should, however, be adhered to as nearly as possible by those whose duty it is to attend to the proper ripening of cream:—

First—As stated above, allow the cream to pass over a cooler as it leaves the separator.

Second—Deliver this cream to the butter-maker as soon as possible.

Third—The butter-maker should reduce the temperature of the cream to a favourable ripening one as soon as possible after it arrives in his factory.

Fourth—He should control the ripening of the cream so that it will be ready to churn in about twenty-four hours from the time of separation.

Fifth—The cream should be churned when it contains between ·6 and ·7 per cent. of lactic acid.

Sixth—The temperature of churning should be about 52° F. in Summer, and 56° F. in Winter.

The most perfect conditions for butter-making are those which enable the butter to be made under the same roof as that where the cream has been separated. Owing to the scattered nature of dairying in this country, this method of dairying is not often practicable, the custom being to have one large central factory to which the cream is sent by road from distances varying from 1 to 10 miles, and sometimes more. With this system of dairying in vogue it will be readily seen that a strict adherence to the rules laid down cannot be expected. Regarding rule one, it is seen that its working is only possible where water at a temperature of not more than 65° F. is obtainable. The second rule, namely, that the cream should be delivered to the butter-factory on the same day on which it was separated, will be understood to mean that when farmers separate their own cream they will do so twice a day, and deliver the two separatings every morning. Where public separating stations are used, this is generally carried out, with the exception that, instead of separating twice a day, as they undoubtedly ought to do during the summer months, they usually separate but once a day, delivering this cream daily. The third rule, regarding the reduction of the temperature to a favourable ripening one as soon as possible after the cream reaches the central factory, must, owing to the irregular deliveries of the cream, undergo considerable changes according to the stage of ripeness in which it arrives. In the summer-time it is, unfortunately, the common practice for cream to arrive at the central factory considerably over-ripe, and instead of the butter-maker reducing it to a favourable ripening temperature, his only hope is to reduce it to churning temperature straight away, and churn it that afternoon, if possible. This can only be done effectually by the following method, namely, pass the cream over a circular cooler as it is delivered, reducing the temperature to about 52° F., which can be done by passing cold brine through the cooler, instead of ordinary cold water. The cream can then remain in a ripening vat until the butter-maker is ready to churn it.

There is one objection to churning the cream on the day it arrives, and that is, that though all the creams may be ripe, or over-ripe, they should be allowed to blend so as to become of a uniform ripeness for some hours before churning takes place, otherwise the loss of fat in the butter-milk will be higher than under proper circumstances of ripening. The fourth rule, regarding the control of ripening while the cream is waiting to be churned in the central factory, it will be seen, greatly depends on the conditions controlling rule 3; but we will take it that the cream arrives sweet and in good condition at the central factory, then the butter-maker should be able to control the ripening, so that he shall be able to say at what time next day it will be fit for churning. In order to do this he should have cream-vats which are capable of controlling the temperature, because, though he may reduce

the temperature of the cream when it arrives, unless there is some means of regulating the temperature afterwards, it will during the warm nights of an Australian summer rise considerably, and the cream may be over-ripe before he is ready to churn it next day. The usual cream-vat, as used in this country, contains coils through which brine circulates, and this is an effective method for reducing the temperature slowly, or for keeping the temperature from rising. Our winters here are seldom so cold as to necessitate any method for warming the cream so as to insure a favourable ripening temperature; but, still, in the higher and colder districts, when winter dairying is carried on, it should be possible for the factories therein situated to pass hot water or steam through the coil of pipes which, in summer-time, carry cold brine. All this, of course, refers only to what is understood as the natural ripening of cream; later on I shall deal with the ripening of cream artificially. The fifth rule—namely, the amount of acid which should be present in cream before it is churned—is a very important one. Sweet cream can be made into butter; but such butter will not have the flavour demanded by the consumer, besides which, when sweet cream is churned, the process of churning is much more difficult, and occupies considerably more time; also, the percentage of butter-fat which passes away in the butter-milk is very much higher than when sour cream is churned. This loss in itself is so great as to make the churning of sweet cream highly unprofitable, unless a much higher price could be obtained for the butter so produced, which is not the case. Butter-makers who have had considerable experience are able to tell by the appearance, taste, and smell of the cream when it is ready for churning; but the young butter-maker will not be able to judge the amount of acidity present by such observations; and for the purpose of determining when cream is ripe I should strongly recommend him to employ what is frequently termed the acid test. This test is extremely simple, and consists in nothing more than measuring with a *burette* the amount of soda solution, of a known strength, which it takes to neutralise the acid present in a given quantity of cream, using an indicator to show when all the acid has been neutralised. (In issue of April last are given details of this test.)

The Temperature of Churning.

Rule 6 deals with the temperature of churning, and on this point there is considerable difference of opinion. Modern workers believe in using low temperatures. At one time 56 to 58 degrees F. was laid down as the churning temperature for summer, and 60 to 62 degrees F. as a winter churning temperature. The methods for determining the amount of butter-fat left in butter-milk have, however, become so simple that every factory-manager is enabled to test his butter-milk daily—a practice which he should always carry out—and it has been shown that a more complete churning can be got without interfering with the texture of the butter when lower temperatures are employed in churning, and I personally favour a temperature not higher than 52 degrees F. for summer and 56 degrees F. for winter churning in this country.

It has also been shown that butters churned at the lower temperatures keep better than those churned at high temperatures, one reason for this being the facility for churning the grains into a fair size without over-churning, which latter is liable to happen at the higher temperatures, and then the grains or lumps of butter are so large that they lock in some of the butter-milk, which it becomes impossible to wash out.

The Grading of Cream.

In addition to the six rules above laid down for the treatment of cream, there is one other, and, perhaps, the most important of all for factory-managers, namely, that all cream should be graded or classified on its arrival at the central factory, and strained before it is allowed to pass over the cooler. There should be distinct vats for good cream and for inferior cream, and under no circumstances should even a gallon of inferior cream ever be allowed to pass in with the cream intended for making first-class butter. Unfortunately, most of our factory-managers have not the experience in the grading of cream which the present conditions of dairying call for. With sweet cream tainted and untainted, slightly sour cream tainted and untainted, very sour cream the bulk of which is badly tainted, daily arriving at a central factory, it is by no means an easy matter to so classify or grade it so correctly as to insure that no mistakes have been made. Frequently cream will arrive perfectly sweet which contains the germs of injurious fermentations so numerously that a good butter can never be made from it, and still the germs may not have been sufficiently long therein to be able to set up their typical fermentation, which would enable the factory-manager to detect the taint. Under such circumstances this cream may pass in with all the superior cream, and when the entire lot has been ripened the whole mass may be tainted. There is but one thing for factory-managers to do in such cases, leaving out that of pasteurisation, and that is, when he finds his butter not up to the mark, to set aside a small sample of each cream received, and classed as first, and allow these samples to ripen separately in a clean place, and in a good atmosphere. He will then, on testing these creams when they are, say, twenty-four or thirty-six hours old, be able to detect the bad ones, and he can mark them for rejection next day into the second-grade vats.

The Methods adopted for Storing, Ripening, and Cooling Cream in Australia.

I have referred to the proper method of cooling and ripening cream, but justice cannot be done to the subject unless we compare the methods in general use in this country as well as those in other countries. The following systems are used here:—(1.) That above referred to which has latterly been put in force in a few creameries. The cream in this case is passed over a circular cooler, where it is cooled to either ripening or churning temperature; it is then passed into ripening or storage vats where the temperature is controlled, these vats being in a well-lighted and well-ventilated room which it is

not necessary to cool artificially beyond the fact that the walls might be insulated.

(2.) The pumping of the cream into vats, through which coils containing cold brine are constantly moving, and allowing the cream to remain there until it is sufficiently cool for churning purposes. This system is found to work fairly well, but it is not so economical nor so well calculated to lead to the production of a good class butter as system No. 1, especially in factories where a high percentage of the cream received comes from private separators, a considerable portion of which is certain to be ripe and will require instantaneous cooling on its arrival at the central factory. This instantaneous cooling is only possible when a cooler is employed to pass the cream over in thin streams, thus bringing a small body of warm cream into contact with a large body considerably colder, as is the case in the first system described.

(3.) Another method, and perhaps the worst conceivable, for cooling and storing the cream is to place the cans containing the cream in a cold dark room and allow them to remain there without the cream being stirred until it is cold enough to place in the churn. This sometimes takes one day and sometimes two days. The errors of this system are—it is the slowest and most expensive method that a factory fitted with refrigerating machinery could adopt; the air in these rooms is pretty certain to be highly charged with germs of an injurious nature (and I have not infrequently found the ceilings of these rooms covered with a mass of mould growth), which, when the lids are removed from the cream cans, are deposited into the cream causing in time the taints peculiar to their species. Also the atmosphere in these rooms is of a damp and musty nature, and in this manner the cream becomes tainted just the same as it will if locked up in a room where there are onions or any strong-smelling substances.

If a cold room is to be used for the purposes of storing cream there is no valid reason why it should not be provided with a window and a ventilator. Sunlight is a great destroyer of micro-organisms, and it is also a great enemy to dirt. If one enters one of these cream dungeons he cannot see whether it is clean or dirty, even by the use of the usual method employed for lighting, namely, a candle or lamp. Hence, as a rule, the corners serve as places for dirt to accumulate. Rarely are these rooms limewashed, and if they are to be kept sweet they will require washing with quicklime all over, including the floor and ceiling, at least every two months. It would be a good thing for the dairying industry if this system of cooling cream was preventible by law.

We now come to the methods adopted for cooling cream in other countries, and as the two European countries that have made the greatest strides in factory dairying are Ireland and Denmark we shall discuss their systems. The method adopted for the cooling and ripening of cream in the average co-operative factory in Ireland is as follows:—

As the cream leaves the separator it is run into what is known as Swartz cans. These are deep narrow vessels holding about 9 gallons

each. They are about 2 feet high, and have a diameter only of about 8 inches. When one of these is filled it is plunged into a cold water tank, it being possible to get water from the spring wells which are found in connection with every factory in that country at a temperature ranging from 52° to 56° F. By this means the cream is cooled gradually, and the water being changed from time to time it becomes reduced to ripening temperature in a couple of hours. It is then allowed to remain in the water trough until next day, when the cream is churned. Some of the more modern factories adopt the method of running the cream over a cooler and then into these Swartz cans, or into large ripening vats. It is not necessary to adopt the same method of controlling the temperature of the cream in these vats in a climate like that of Ireland as we employ here.

These ripening vats are not fitted with cold brine coils, but are generally what are known as jacketed vats, into which cold water is allowed to circulate in summer, and into which space steam is allowed to issue for the purpose of warming the water and hence heating the cream during the winter months. The cream is ready to churn when it is 24 hours old without the aid of any artificial ripening, that is of course when pasteurising is not done. In the winter months it is a custom to either allow the cream 48 hours to ripen, or to add a starter either in the shape of butter milk or a pure culture of lactic acid bacteria artificially cultivated, and then churn when the cream is 24 hours old.

The Danish System.

The Danish system of treating and ripening cream has altered considerably since pasteurisation became general in Scandinavia. As will be understood from what has been written in previous articles, cream which has been pasteurised is never allowed to ripen naturally, and hence the Danish method of ripening cream is wholly carried out by the use of pure cultures of lactic ferment, which latter is an ordinary article of commerce throughout Denmark. The origin of pure cultures for butter-making is due to the researches of Professor Storch, of Copenhagen, and the butter-maker in Denmark has implicit faith in the advantage of using a freshly made starter from a pure culture of lactic ferment. Since the introduction into Denmark of the law dealing with the compulsory pasteurisation of all milk used as food for stock, the factories pasteurise either the whole milk before separating, or the cream and separated milk afterwards. The latter system was that at first employed, but the former is now coming into more general use, the milk being heated to 185° F. before separating. As the cream issues from the separator it is elevated over a cooler as described above, and the temperature reduced to 65° F. It is then run into ripening vats, where the starter is immediately added, and churned when it is 24 hours old. I might here point out that the separating and churning are all done under the same roof in Danish factories, the home separator being an unknown quantity in Danish dairying.

The Use of Molasses in Fodder for Stock.

When the use of molasses, as a portion of the fodder for horses doing heavy work, was discussed in the *Agricultural Gazette* for February, 1898, by Mr. Walton, F.C.S., it is probable that only small quantities of this valuable product were regularly utilised for sheep, cattle or horses, in New South Wales. Mr. Walton pointed to the success achieved with molasses in Fiji, where the Colonial Sugar Refining Company's horses, to the number of 1,000, were fed on maize, bran, cane tops and molasses. Since then, this bye-product of the sugar industry has received widespread attention, and to-day there is scarcely anyone in New South Wales interested in stock who is unaware of the value of it as a fodder adjunct. But it is in countries of the Northern Hemisphere where stock have to be artificially fed for a great portion of every year that fodder problems are most thoroughly investigated and understood. This is especially the case in France and Germany, where the enormous expansion of the beet-sugar industry, under the stimulus of national bonuses, provides an almost inexhaustible supply of by-product in the shape of molasses. Formerly the greater portion of this matter was converted into alcohol, and a great deal of it is still so utilised, but during the last five or six years, farmers and stock-owners have realised the feeding value of it, and thousands of carefully planned experiments have been conducted to determine the most economical means of using molasses. At first grave mistakes were made in feeding molasses to excess, and people who had purchased it as the sole substitute for grain, hay and roots, were disappointed. But when it was used judiciously in combination with other foods that provided the bulk necessary for cud and digestion, there no longer remained any question as to the help this food would be to stock-owners.

Prof. Leroux, of the French Department of Agriculture, says in the *Journal de l'Agriculture*, that two questions he has been called upon to answer are :—

(1.) Has the agriculturist any advantage in using molasses in his cattle rations ?

(2.) Is the alimentary value equal or superior to its cost ?

His answers are embodied in the following report :—

"It was known long ago what effect molasses had as food. It was known that damaged forage could be used after the addition of a little molasses. It was also known to have a good effect in curing or benefitting broken-winded horses.

"But it is only two or three years since its real value as food was examined.

"It is easy to understand that sugar, as a source of muscular energy, should have a certain value. Owing to its digestibility, we may fix its value as food for animals at 1½d. for 2¼lb., thus giving an alimentary value of 2s. 10d. per cwt. to molasses.

"This substance contains, amongst others, nitrogenous matter, which contributes to its nutritive qualities.

"In order to ascertain, by experiments, the nutritive value of molasses, very careful trials have been made by Dickson and Malpeaux, at the Agricultural College of Berthonal, with sheep, pigs, heifers, milch cows, and horses. The results were as follows:—

"*1st Trial.*—In this the ration consisted of 10 lb. of pulp, with 1½ lb. of oilcake. Twelve sheep, as much alike as possible, were divided into two lots—the one receiving the previous ration, the other the same ration, with the addition of 10⅜ oz. of molasses. In order to avoid individual influences, the two lots were changed about at the end of twenty days. The results, after forty days, showed a daily individual increase in weight of 1¾ oz. to 2 oz. for those sheep which were receiving the molasses; which makes nearly 2⅛ lb. live weight for a consumption of 13⅛ lb. of molasses, producing thus an increase of value of 9d. to 10d. for the outlay of 4d. to 5d.

"*2nd Trial.*—Half of the oilcake (12⅓ oz.) was replaced in this ration by 14 oz. of molasses. The increase in weight in forty days of the lot of sheep fed on half oilcake, with the molasses added, was 80½ lb., whilst the lot fed on cake only, without molasses, only increased in the same time by 73 lb. Thus 14 oz. of molasses produced a more rapid fattening than 12⅓ oz. of oilcake (linseed).

"An experiment made with four Yorkshire pigs, of which two received a ration composed of 11 lb. of cooked potatoes, 4 lb. 6 oz. of mixed rye and beans, and 2 gals. of swillings; and the others the same ration, with the addition of 14 oz. of molasses per head; gave an increase in forty days of 106½ lb. for the first, and 122½ lb. for the second.

"The difference of 16½ lb. of live weight was obtained at a cost of 70½ lb. of molasses. Molasses, therefore, appears to be wonderfully suitable in the food of pigs.

"Other experiments showed the favourable results from the use of 1 lb. 10 oz. of molasses in the daily food of heifers.

"For milch cows the results have been less conclusive. They have shown a very slight increase of richness in cream of the milk, but it has not paid for the cost of the molasses.

"Finally the experiments made with horses shows that 2⅛ lb. of oats can be very advantageously replaced by 2⅛ lb. of molasses. The horses maintain the same vigour, and even seem to fatten on it.

"The preceding trials are confirmed by numerous experiments made here and there in the beet-growing districts.

"Messrs. Lambert and Son, of the Toury Sugar Works, gave the following ration to their horses:—Crushed oats, 17 lb.; hay, 13 lb.; wheaten bran, 3 lb. 5 oz. They have replaced it with 7 lb. 3 oz. crushed oats; raw molasses, 7 lb. 11 oz. (containing 76 per cent. pure molasses); hay, 14 lb. 5 oz. At the present price of oats, the new ration effects a yearly saving to the proprietors of £10 per horse.

"A large number of cultivators in the district have used molasses this year (1901).

"M. Pluchet, of Roye, made a mixture of molasses and grains, which he baked in the oven. It makes excellent bread.

"M. Roland, of Courtillet, noted the fattening of his cattle by a mash mixed with 4 lb. 6 oz. of molasses per head, and in his sheep by a diet of mash with 10¾ oz. molasses per head. The fattening is more rapid than with oilcake, and the meat is excellent.

"M. Delcporte, Bayart, Nord, and M. Martin, of Ermenonville, add 17½ oz. of molasses to the daily rations of full-grown beasts.

"M. Poulin, of Crisolees, made a mixture of 2 cwt. of molasses, and the same quantity of bran, and gave 8 lb. 14 oz. of this to cattle for fattening. His horses received with their forage 2½ lb. of molasses per head.

"At the sugar works of Méru there are at the present time three beasts fattening, which receive 6 lb. 10 oz. of linseed, 5 lb. 8 oz. molasses, 2¼ lb. of bran, and 11 lb. of hay.

"M. Petit, Hénouville, mixes the molasses with oil-cake or cracked maize. This mixture may be kept in bags. It will keep for several weeks.

"If we required other instances we could cite the experiments made in Germany, which have demonstrated that the sugar contributes to the formation of fat, increases the digestibility of the food, gives a horse a better appearance and greater endurance, and prevents colic. Sixty-four regiments of German cavalry used molasses in 1900.

"It is well understood that molasses contain malates, tartrates, citrates, sulphates of soda and potash, which are laxative, and should not be given in excess to farm animals.

"There will be no ill effects if not more than 3 lb. 5 oz. for horses, 5½ lb. to 6 lb. 10 oz. for cattle, and 10¾ oz. to 14 oz. per head for pigs and sheep are given.

"Agriculture can thus utilize all the molasses from the beet sugar manufactories, for the 230,000 tons of last season barely sufficed to supply 2 lb. per day to 9 per cent. of the full-grown horses and cattle.

"We have, therefore, an immediate pecuniary interest in the use of molasses in rations, and in replacing partly, weight for weight, the oats for horses and oil-cake for cattle.

"We have, besides this, a still greater interest in saving the country distilleries from the disastrous competition of 22,000,000 gallons of alcohol made annually from molasses, and we may hope also to increase the markets for our best growers."

Molasses in the Ration of Working Horses and Bullocks.

M. Nicolas gives, in the same journal, the following account of his experiments with molasses in the ration of working horses and bullocks. His remarks concerning the use of waste flour to make up into a sort of cake, appear to be well worthy of consideration where small numbers of valuable stock have to be specially fed and there are extra difficulties in the way of transport.

In September, 1901, I visited one of our most prominent and enterprising agriculturists, M. Leon Martin (at Ermenonville, Oise),

who kindly permitted me to see, and take part in the preparation of the food for his cattle, bullocks, and horses. This consisted simply of chopped straw, bran, waste flour, molasses, and water, and the animals received nothing else. The preparation is rapid and inexpensive, one man being easily able to prepare sufficient food for 100 animals in one day. M. Martin allowed me to see his horses and bullocks, all of which were superb and in splendid condition, notwithstanding that they had not had a grain of oats for twelve months.

They are very fond of this food, and leave absolutely nothing in the manger.

The visit to Ermenonville convinced me that it would be of very great advantage to use molasses, and on my return home I at once made preparations to do so.

I fitted up a special room for the preparation, and from the 11th of November, I began to give molasses to my thirty-eight draught-horses and twelve working bullocks.

My animals made no difficulty about accepting the new provender, but ate it greedily, sometimes not touching the hay, which at first was left in the rack for them for the night.

I was greatly surprised and pleased at what seemed a decided success.

Previous to giving them molasses their food consisted as follows :—

		s	d
$3\frac{1}{4}$ gallons of oats, at 6s per 22 gallons	...	1	0
$4\frac{2}{7}$ lb. of bran, at 5s per cwt.	..	0	3
17^{3} „ hay, at 2s 3d „		0	5
$13\frac{1}{5}$ „ straw, at 1s 6d „	..	0	$2\frac{1}{2}$
Total cost per horse per day	.	1	$10\frac{1}{2}$

During the heaviest work, my horses received a supplementary allowance of $3\frac{1}{2}$ pints of oats per day.

From November 11 last year they received the feed mixed with molasses, and composed as follows :—

	s	d.
$13\frac{1}{5}$ lb of oaten chaff (husks) or chopped straw, at 1s. 6d. per cwt	0	$2\frac{1}{2}$
$13\frac{1}{7}$ „ bran, at 5s per cwt.	0	8
$3\frac{1}{5}$ „ molasses at 2s $7\frac{1}{2}$d per cwt.	0	1
$13\frac{1}{5}$ „ wheaten straw, at 1s. 6d. per cwt. (serving also for litter)	0	$2\frac{1}{2}$
$1\frac{1}{3}$ „ gallons of water		
Total cost per horse per day .	1	2

Which shows a difference of $8\frac{1}{2}$d. per day per horse.

This means a considerable saving on thirty-eight horses, and I may add that no horses could be in better condition or behave better than mine.

When returning from the field they are as gay as larks, consume their new food with avidity, and show dissatisfaction if deprived of it. From the end of December last I have completely left off the hay ration given to them at first for the night (11 lb. for three horses), in order not to make the change too sudden. The trial has been made, and never again shall any of my horses eat either oats or hay.

My crop of 1901, which would have been partly consumed by my horses, shall go to market.

I prepare the food in the following manner for nine horses, as they are placed three in each stable :—

The chopped straw or wheaten chaff is spread on the floor, and sprinkled with half the molasses dissolved in ⅔ of a gallon of water; the whole is stirred up, then the bran and waste flour is spread and stirred up again; afterwards the remainder of the molasses diluted as before is added, stirred up, and finally the whole mixture is placed in a large heap, which is then thrown in a corner of the room.

The mixing is thoroughly done, so as to obtain a homogenous mass, which is put into sacks, each containing rations for three horses.

Since November 11th I have also given molasses to my bullocks, on which they thrive well, and which I have definitely decided to continue.

Their previous rations were as follows :—

		s.	d.
77 lb. of	beet, at 16s. per ton	0	6¼
4⅖ ,,	bran, at 5s. per cwt.	0	3
5½ ,,	hay, at 2s. 3d. ,,	0	1½
4⅖ ,,	oil-cake, at 6s. ,,	0	3
13⅕ ,,	oaten or wheaten straw, at 1s. 6d. per cwt.	0	2½
	Total cost per bullock per day	1	4¾

Their present rations are :—

	s.	d.
11 lb. oaten chaff or chopped straw, at 1s. 6d. per cwt.	0	2
11 lb. bran, at 5s. per cwt.	0	6½
3⅓ lb. molasses, at 2s. 7½d.	0	1
22 lb. beet, at 16s. per ton	0	2
6⅗ lb. oaten straw, at 1s. 6d. per cwt.	0	1¼
1⅓ gallons water.		
Total cost per bullock per day	1	0¾

The difference in cost is not so great as for the horses, but still 4d. per day per head is not to be despised, and the wheaten and oaten chaff is used up (chaff here means the husks—"cocky chaff").

My bullocks are in perfect condition, and have never been more vigorous; they weigh from 17 to 20 cwt. each.

The rations for the bullocks should be varied according to the seasons; the wheaten chaff or straw should be augmented at a certain period to replace the beets, which will reduce the cost.

I may add, that all my wheaten chaff is consumed in the molasses food, and before, I could not get even 9d. per cwt. for it. The same with the chaff from the oats, which is used in the proportion of one-fourth. Reckoned at 1s. 6d. per cwt., it shows a good profit, because, formerly, I used to spread on the fields what was not mixed with the beets. I had each year a large surplus which was practically lost, but is now used at 1s. 6d. per cwt., in preference to chopped straw, which latter I can sell in its natural state. Besides, which, it contains more nutriment than the straw.

Where the necessity for special feeding is most urgent, the difficulties of transport are, as a rule, greatest, and anything in the shape of a highly concentrated fodder is worthy of attention.

M. Emile Saillard, in the French *Journal of Agriculture*, thus describes a fodder that might, in very special cases, be handy if at all procurable. No doubt it would, under present circumstances, be rather costly, but then the quantities requisite to sustain life are extremely small.

A new kind of Cattle-food made with Molasses.

At the last Exhibition in Berlin I visited the Central Creamery in that city, where is manufactured a kind of forage composed of the waste matter from the milk mixed with molasses.

The following is the manner of preparing it, originated by Mr. Ernest King, of Duppal:—The milk coming from the centrifugal separators consists on an average of—

Water	91 per cent.
Casein	4 ,,
Fatty matter	0·3 ,,
Sugar	3·9 ,,
Salts	0·8 ,,

This is principally used for the fattening of calves, sheep, &c.; but many creameries cannot easily dispose of it at a remunerative price, and to them, as well as to the sugar manufacturers, the King process is of interest.

A precipitant of the casein is added to the separated milk, and the whole is heated in a semi-cylindrical horizontal vessel.

The albumenoid matter precipitates rapidly, and is separated from the liquid by a press in the same manner as juice is extracted from beetroot, the whole being placed in a rectangular recipient with perforated sides, and a cloth spread on the bottom.

The solid matter is of a nice white colour, and is easily broken in pieces. By a kind of mill this is made into a fine powder, which contains 30 to 40 per cent. of water. It will not keep long in that state, but is mixed with other feed, such as arachide oil-cake, rice-bran, crushed maize, palm farina, &c., and to this mixture is added molasses by means of a continuous apparatus consisting of a tube, in which an agitator and propellor revolves.

The Central Creamery in Berlin daily makes 400 to 500 cwt. of this forage, and can sell it easily to the farmers at a price of 4s. per cwt., when it contains 30 to 35 per cent. of water, and at 5s. 6d. per cwt. when it only contains 19 to 21 per cent. of water. In the latter case it will keep for some time, and, consequently, may be transported to a distance. A sample of this food, containing 19 per cent. of water, has been analysed with the following results:—

Water	19·86 per cent.
Albumenous matter	18·94
Nitrogenous matter (not albumenoids)	5·12
Sugar	16·00
Invert sugar	1·86
Fat	2·46
Cellulose	18·27
Other extracts (not nitrogenous) ...	10·72
Ash	6·77

NOTE:—The German molasses does not contain 44 per cent. of sugar, like that of France; and the oil-cake contains 9 to 12 per cent. of water.

The digestibility of the albumenous matters, determined according to Stutzer's method, was 80·86 per 100.

Mr. Schmidt, of Lohme, experimented with this food on three of his farms.

On each farm he gave it to 10 cows, and found that it can replace, weight for weight, a mixture of bran and cotton farina (cotton-seed meal—a common oily food in America), and is very suitable for cattle, horses, pigs, and poultry. The quantities to be used are—5½ lb. for cattle and horses, 3½ lb. for pigs, and 5½ lb. for 50 head of poultry.

We think that the King process will be useful to urban creameries, which cannot always dispose easily of their separated milk at a remunerative price, and will at the same time increase the use of molasses in districts where beet is not grown.

Molasses for Milch Cows.

M. Nicolas, in another article in the *Journal de l'Agriculture*, states:

I was desirous of trying feeding experiments on my cows, for in their case the profit would be very considerable if the trial was successful. I selected from my herd 20 cows of the same age and race which had calved at nearly the same date, and to 10 of them I gave the ordinary feed, while the other 10 received the molasses feed. The milk produced by each cow of the two lots was measured on November 20, and the day following they were all weighed. Every 10 days—that is, on November 30 and December 10 and 20—the milk obtained from each cow was measured.

The 10 cows which received the usual feed had a daily ration as follows:—

			s.	d.
56 lb.	half-sugar beet*	at 16s. per ton	0	4¾
4¾ ,,	oilcake	,, 6s. per cwt.	0	2¼
5½ ,,	bran	,, 5s. ,,	0	3½
11 ,,	hay	,, 2s. 3d. ,,	0	3
5½ ,,	oaten straw	,, 1s. 6d. ,,	0	1
	salt			
		Total	1	3

The other 10 experimented with received the following ration:—

			s.	d.
12 lb.	chaff or chopped straw	at 1s. 6d. per cwt.	0	2
$3\frac{3}{10}$ lb.	molasses	,, 2s. 7½d. ,,	0	1
7⅗ ,,	bran	,, 5s. ,,	0	4½
22 ,,	beets	,, 16s. per ton	0	2
6⅗ ,,	oaten straw	,, 1s. 6d. per cwt.	0	1
		Total	0	10½

Difference, 4½d.

The saving per day by adopting this feed would be 4½d. per head, and would represent a handsome sum on my herd, which numbered from 150 to 225. Unfortunately, the result did not turn out favourable to the use of molasses. In fact, the 10 cows which were given molasses lost 8¼ gallons of milk and 268 lb. in weight from November 20 to December 20,† whilst the other 10 only lost 1½ gallons of milk

* Described in *Agricultural Gazette* last month.

† It should be remembered that these dates represent the French early winter.

in the same time, which latter loss I attribute partly to the time which had elapsed since parturition, and partly to the colder weather.

The analyses made on November 20 and 30, and December 10 and 20, instead of showing an increase in richness of milk, indicated, on the contrary, a loss of 0·45 oz. of fatty matter per gallon.

In order to complete my experiment, I changed about the feed of the two lots of cows, giving molasses feed to those which had only had ordinary rations, and *vice versa.* This second test confirmed the result of the first.

1. The 10 cows fed on ordinary rations gained, from December 20, 1901, to January 20, 1902, $1\frac{7}{8}$ gallons of milk, after having gained in the interval from December 20, 1901, to January 10, 1902, $3\frac{3}{8}$ gallons. As regards weight, in the first case they having lost 268 lb., now gained 369 lb.

2. The molasses-fed 10 cows lost in the second experiment $7\frac{3}{8}$ gallons of milk and 605 lb. in weight during the same period.

These results seem to indicate conclusively that it is not advisable to give molasses to dairy cows, at any rate under the conditions existing on my estate, where they always received a strong concentrated food. The substitution of molasses for this food to any great extent had not a favourable result, but I know that under other conditions the introduction of molasses in the rations of dairy cattle has proved economical and effective.

I am not inclined to entirely give up the molasses food for dairy cattle, and am at present giving it to my dry cows, which are waiting to calve, and these seem to thrive on it. The following is their ration:—

		s.	d.
11 lb. oaten chaff or chopped straw	at 1s. 6d. per cwt.	0	2
$3\frac{1}{10}$,, molasses	,, 2s. $7\frac{1}{2}$d. ,,	0	1
$6\frac{1}{4}$,, bran	,, 5s. ,, ...	0	$3\frac{1}{2}$
22 ,, beets	,, 16s per ton .	0	2
$5\frac{1}{2}$,, oaten straw	,, 1s. 6d. per cwt. .	0	1
$1\frac{1}{4}$ gallon water			
	Total	0	$9\frac{1}{2}$

The ordinary feed used to cost 1s. 3d. per day; thus a difference is shown of $5\frac{1}{2}$d. per day. I let my cows be drained for 15 days before calving, so as to avoid milk fever, so common in cows which are fed on concentrated food; and perhaps this could be dispensed with altogether, which would be a real advantage.

The correct dose of molasses for each animal does not seem to me to have been ascertained, and I am going to experiment by gradually increasing the doses up to $4\frac{1}{2}$ or perhaps 6 lb. on a small number only.

Note.—In the *Temps* newspaper of January 31, 1902, M. Grandeau quotes the example of a German agriculturist, who actually gives 11 lb. of molasses per day to each of his bullocks, which weigh from 11 to 12 cwt. We have not gone so far as that in France, but I intend to ascertain if the ration given to my cows was sufficient.

Effect of Phosphoric Acid when given to cattle fed with Molasses.

My friend M. Joulie, who has been kept informed of my experiments with molasses in cattle food, was not surprised at the negative result

in the case of the milch cows. He expected it, and advised me to continue similar trials with the addition of veterinary phosphoric acid. (See Note 2, next page.)

This I proceeded to do according to his instructions, as follows:—

1. Six cows on ordinary rations had 20 cubic centimetres (1 cubic centimetre=0·061 cubic inches) of phosphoric acid added in the mash or oil cake, which dose was doubled 10 days afterwards.

2. Six cows continued to be fed with molasses with the addition as above of 20 cubic centimetres of phosphoric acid.

3. Six other cows received the ordinary feed, that is to say, the same as the first lot, but no acid.

The experiments began on February 1, and the various milk yields were analysed on January 31, and every ten days afterwards up to March 2. The milk was measured six times between January 30 and March 2.

The following is the table of production, and richness in butter:—

Production of Milk from cows with and without Phosphoric Acid.

Number o Cow.	Jan. 30	Feb. 3	Feb 6	Feb. 10	Feb. 20	March 2
995, 290, 281, 286, 188, 186	Cows receiving ordinary ration and phosphoric acid. 20 cubic centimetresof phosphoric acid.			40 cubic centimetres of acid.		
	Gals. 16⅛	Gals. 18	Gals. 18	Gals. 18¼	Gals. 17⅜	Gals. 16¾
193, 194, 220, 302, 303, 983	Cows fed with Molasses and receiving phosphoric acid. 20 cubic centimetres of acid.			40 cubic centimetres of acid.		
	Gals. 13¾	Gals. 14¼	Gals. 14	Gals. 15¾	Gals. 17¼	Gals. 14
332, 331, 333, 334, 335, 336	Cows receiving ordinary rations without acid.					
	Gals. 19¼	Gals. 19	Gals. 19½	Gals. 18⅝	Gals 18¾	Gals. 18⅜

ANALYSES OF MILK.

Cows receiving ordinary ration and acid.

Jan. 30	... ...	6 ounces of butter per gallon.
Feb. 14	... ...	6·25 ,, ,,
Feb. 21	... ...	6·27 ,, ,,
Mar. 4	... ...	6·48 ,, ,,

Cows receiving molasses feed and acid.

Jan. 30	... ...	6·70 ounces per gallon.
Feb. 14	.. ..	7·02 ,,
Feb. 21	... ...	6·42 ,,
Mar. 4	... ...	6·83 ,,

Cows receiving ordinary rations without acid.

Jan. 30	... ...	7·53 ounces per gallon.
Feb. 14	... ...	7·53 ,,
Feb. 21	... ...	7·53 ,,
Mar. 4	... ...	7·12 ,,

As regards production the phosphoric acid appears to exercise a marked influence. Thus, whilst the third lot produced four-fifths of a gallon of milk less from February 1st to March 2nd, and 0·42 oz. less of butter per gallon, the first lot which received exactly the same food, but with the addition of phosphoric acid, had an increased production of $1\frac{7}{8}$ gallons of milk and 0·48 oz. of butter per gallon. These increases can only be attributed to the influence of the acid, because the animals of these two lots were fed otherwise in exactly the same manner. Finally, the second lot, which continued to receive molasses food, gave a still more striking result. From December 20th to January 20th these animals, then numbering ten, lost $7\frac{1}{2}$ gallons of milk and 0·45 oz. in butter per gallon; whilst, with the addition of the acid, the production increased by $3\frac{1}{2}$ gallons from the starting point. Not only this, but the advantage was very considerable by reason of the smaller cost of feed, being not less than $4\frac{1}{2}$ per head per day, while the richness in butter increased 0·45 oz. per gallon. After obtaining these results, I shall not hesitate to put fifty of my cows on molasses feed with phosphoric acid, and shall afterwards give it to the whole of my herd, if the effect comes up to my expectations. I am also going to give phosphoric acid to my horses. In consequence of the remarkable experiments and studies of M. Joulie, and on his advice, I shall add 40 cubic centimetres of phosphoric acid to their rations. This diminishes the tendency to form phosphate of lime in the limbs, particularly in the joints; from which cause arise accidents which depreciate the value of the horses, and lessen their longevity. The use of phosphoric acid is quite a novelty in the food of cattle, and it is M. Joulie who has made known its functions and effects, thereby rendering fresh service to Agriculture.

Note 1.—Certain molasses contain a very large quantity of potash salts, which are extremely purgative. Therefore they should be used with caution, especially for milch cows, as in their case, purgatives lead to loss of milk.

Note 2.—Veterinary phosphoric acid contains 50 per cent. of ortho-phosphoric acid, or 30 per cent. of anhydrous phosphoric acid.

Note 3.—Phosphoric acid has for its principal use the acidifying of the blood, and the holding in solution (in the blood) of the phosphates of lime, magnesia, &c., so that the surplus of these, which is not utilised, is eliminated in the urine; thanks entirely to the acidity of the blood.

M. Nicholas advises farmers to buy the molasses, and mix the food themselves, as it is cheaper than buying the prepared molasses food-mixtures in the market, many of which are not properly constituted. He now gives to each of his 38 horses, as daily rations, since March 15th, 1902—

		s.	d.
$13\frac{1}{5}$ lb. of	oaten chaff (husks) at 1s. 6d.	0	$2\frac{1}{2}$
$4\frac{2}{5}$,,	bran at 5s. per cwt.	0	3
$6\frac{3}{5}$,,	crushed oats at 6s. 9d. per cwt.	0	5
$3\frac{1}{5}$,,	molasses at 2s. $7\frac{1}{2}$d. ,, ...	0	1
$1\frac{1}{3}$ gallon water ...	... ...	...	
Labour and manipulation	... ...	0	1
	Total for horse per day	1	$0\frac{1}{2}$

Prizes for Dairy Farms and Crops in South Coast District.

In response to representations made by the South Coast Agricultural and Horticultural Societies' Union the Hon. the Minister for Agriculture last season granted the sum of £50 to be awarded as prizes for dairy farms of certain areas, and for the best crops of maize and potatoes. The South Coast Agricultural Union framed regulations to govern entries, and divided the money into prizes to be awarded in accordance with points allowed by the judge appointed by the Union.

Mr. John James, of Rose Valley, Gerringong, was invited to undertake the duties of adjudicator for all the entries. His reports on the farms have been ready for some time, but some unavoidable delay has been caused through the necessity for determining, in the case of maize, the shrinkage in harvested crops.

In submitting his report to the Secretary of the Union, Mr. James says:—"I have pleasure in submitting herewith a detailed report on the various farms entered for the above competition, and regret very much that the season has been one of the most unfavourable, perhaps, ever experienced by this district, or, at any rate, by the greater portion of it, though some few spots have been favoured latterly with showers, and are not so bad. Through no fault of their own, some competitors have not their cattle in fit state for a competition, and have besides been forced to draw on their supplies of fodder, so that under more favourable conditions the points allotted might be very much changed. It is possible at present to see all the worst features of the farms, and quite impossible to draw a fair comparison between a herd of cows on short allowance and another that is having full and plenty. I have carefully looked at and appraised them as they are. I would, in justice to the competitors and to myself, like to have a second look and comparison in some cases, but the distance is too great, and on the score of keeping down expenses, I have given you my notes as taken down at each inspection.

"One difficulty I have experienced is that some owners have other paddocks or runs, on which some of their stock are depasturing, and are, therefore, not counted. Others have had paddocks, but probably got their stock home for inspection, which is hardly fair, but could not be avoided. Another trouble I have found is in estimating the value of the growing fodder, 1 acre on some farms being equal to 2 or 3 on others, so that area alone could not be considered.

"I have not placed any great value on the dwellings in considering the improvements, as long as they were sufficient and comfortable. My one desire has been to assess each farm and stock as a money-making concern, while giving fair comfort and convenience to the occupier."

The following shows, in tabular form, the number of points gained by each entry in the farms of over 100 acres and of 50 to 100 acres :—

BEST DAIRY FARMS.

ENTRIES.			Scale of Points fixed by the South Coast Agricultural Union.					
			General features of farm as regards suitability and lay of land, shade and shelter, water supply.	Improvements, comprising buildings, fences, gates; having regard to general convenience rather than absolute money value.	Live stock — horses, cattle, pigs, and poultry, taking into consideration their value for money-making from the farm rather than purity of breed.	Provision for feeding stock, including paddocks of artificial grasses or of green fodder and crops, sheds or stacks of hay or ensilage.	Total points awarded. Maximum, 100.	
Name.	Address.	Acreage.	25	25	25	25 =	100	Result.
			Farms over 100 acres.					
P. H. Morton ...	Barrengarry	600	23	23	23	24	93	1st Prize, £6.
A. F. Warden ...	Milton	330	21	23	21	20	85	2nd Prize, £4.
Bailey Bros. ...	Gerringong	195	22	20	21	20	83	3rd Prize, £2 10s.
J. W. Cole... ...	Jamberoo...	260	22	21	20	19	82	
John Monaghan ...	Shoalhaven	133	21	21	20	19	81	
W. D. Warden ...	"Goulds," near Milton ..	157	20	19	22	20	81	
M. J. Madden ...	Avondale...	323	20	23	19	18	80	
D. Manson... ...	Albion Park	140	21	20	19	19	79	
R. C. Johnson ..	Albion Park	135	21	20	19	19	79	
E. Hamilton ...	Coombe, between Jamberoo and Shellharbour.	160	19	20	19	19	77	
John Carmody ...	Near Berry	107	20	20	18	19	77	
Geo. Adams ...	Near Bulli	...	18	24	18	17	77	
			Farms 50 to 100 acres.					
R. A. Gibson ...	Wollongong	98	23	20	21	21	85	1st Prize, £6.
H. Bartlett ...	Albion Park	100	22	21	22	19	84	2nd Prize, £4.
John Hill	Coolangatta	75	21	21	20	21	83	3rd Prize, £2 10s.
W. Caffrey... ...	Shoalhaven	60	20	21	22	19	82	
J. S. Turner ...	Terara, Kiama	99¼	21	19	21	19	80	
D. E. Weir ...	Kiama	80½	20	20	19	20	79	
G. Gear	Tulimbar, Macquarie Riv.	87	19	23	19	16	77	

Potatoes.

Report of judging of crops of 1 acre of potatoes competing for prizes given by the Department of Agriculture under control of the South Coast Agricultural Union:—

I regret that considerable delay has been occasioned in sending in my report of judging in the above competition, owing to one of the competitors asking for an extension of time, as his was a late crop. Eight entries were received for this prize, and of these, one, Mr. McCaffrey, of Pyree, withdrew, and G. U. Alby, of Sassafras, has not yet given notice of readiness to have his crop inspected.

The first crop inspected was Wilson Bros., near Figtree, Wollongong, on 18th December, 1901. Area about 2½ acres in all, of alluvial flat, close to the bank of a creek. The land has been under cultivation for many years, and was not manured, nor had it received any special treatment; had only been once ploughed before planting, and then had had a heavy fall of rain, followed by wind that had rather hardened it. The variety of potatoes grown was Brownell's Beauty, and though they were of good size and quality gave a very small number to each stem. Planting was carried out in the end of August, and the drills were very wide, only 22 to the chain, or 3 feet apart. A number of trials over the acre gave an average of 36 lb. of potatoes to the chain of drill, or 792 lb. per chain square, being at the rate of 3 tons 10 cwt. 2 qrs. 24 lb. per acre.

Arthur Robinson, Wollongong, crop inspected 7th January, 1902. Area just over an acre; planted end of August and first week in September; variety, Brownell's Beauty; land, alluvial, in splendid condition; cultivation, deep and good; manure, used 4 cwt. to the acre; drills, 23 to the chain, well hilled up, and potatoes in splendid sound condition. Six trials gave an average of 82 lb. potatoes to the chain of drill, 1,886 lb. to the chain square, or 8 tons 8 cwt. 1 qr. 16 lb. per acre.

H. Colley, Jamberoo, 1¼ acre in crop, inspected 13th January, 1902. A piece of very rich alluvial not far from the head of Terragong Swamp. This land had been twice ploughed and lightly subsoiled, and manured with Shirley's Potato Fertiliser, 4 cwt. to the acre, and was in splendid condition; but the potatoes had been checked by a very hot day, and ripened off too soon, one portion still green. The variety used was Brownell's Beauty, 1 ton of New England seed planted early in September. There were 28 drills to the chain on the acre tested, and eight trials gave an average of 85 lb. to the chain of drill, 2,380 lb. to the chain square, or 10 tons 12 cwt. 2 qrs. per acre. These potatoes were of splendid quality, and fairly even in size.

T. Bice, Comerong Island, inspected 24th January, 1902. A crop of 2 acres; portion tested, 7 chains by 1½ chains, planted in September; cultivation, fair; land, alluvial flat in nice order. Brownell's Beauty was again the variety grown. No manure had been used, and the locality had suffered much from dry weather. The number of drills per chain, 26. Six tests gave an average yield of 63 lb. potatoes per chain of drill, 1,638 lb. per chain square, or 7 tons 6 cwt. 1 qr. per acre. The potatoes were of nice quality, but wanted more time.

P. Quinn, senr., Omega, inspected 17th February, 1902. Area just over 1 acre of brush land, up close to the mountain. The land had been ploughed in the winter, then re-worked before drilling. All drilling and after-cultivation had been done by hand hoe. Manured with Australian Manure Co.'s Potato Fertiliser, 4 cwt. per acre. The drills were very close, ranging from 34 to 38 per chain, and averaged 36. Planting had been done about the middle of September; several varieties were tried, but the main crop were Brownell's and Federation. Ten trials gave an average yield per chain of 53 lb., 1,908 lb. per chain square, or 8 tons 10 cwt. 1 qr. 12 lb. per acre.

H. Graham, Bellawongarah, Kangaroo Mountain, inspected 24th February, 1902. Area just over an acre, 5½ chains by 2 chains of brush land—a piece of fairly level land just under a steep slope. Land had been deeply ploughed and well manured, a large quantity of stable and stockyard manure worked in, and fertiliser used. Planted second week in October with Brownell's and Champions, 50 drills, or 25 to the chain. Tests gave an average of 93 lb. to the chain of drill, 2,325 lb. to the chain square, or 10 tons 7 cwt. 2 qrs. 10 lb. per acre. The cultivation of land was good; quality of potatoes good.

AWARDS—POINTS ALLOTTED.

	Weight.	Quality.	Cultivation.	Total
1st—H. Colley ...	50	28	10	88—1st prize, £6.
2nd—H. Graham	49	27	10	86—2nd prize, £4.
3rd—P. Quinn ...	40	26	10	76—3rd prize, £2 10s.
A. Robinson	39	26	10	75
T. Bice ...	37	24	9	70
Wilson Bros.	18	27	9	54

Maize.

REPORT of the judging of crops of 5 acres of maize competing for prizes offered by the Department of Agriculture under regulations framed by the South Coast Agricultural Union.

There were originally fourteen entries for this competition, but owing to dry weather conditions Messrs. D. Manson and W. D. Warden withdrew in January last, and Messrs. R. C. Johnson, C. Sharp, P. H. Morton, and D. M. Pearman at a later stage. The crops of the three first-named had been inspected for points for cultivation. In the other cases of the eight whose crops have been tested two inspections were made in each case, the first just at the tasselling stage.

Mr. W. Anderson's crop at Meroo Meadow, tested 30th of April. Drills 9 chains long, and 83 drills in 5 acres. The yield averaged 59 lb. of cobs to the chain of drill; shrinkage 4½ lb., cores 9½ lb., leaving 45 lb. of grain per chain of drill, 405 lb. per drill, 33,615 lb. from 5 acres—equal to 560¼ bushels of 60 lb., or 600¼ bushels of 56 lb., as now customary. The cultivation was very good, land in splendid order, and drills straight and even. Corn planted the first week in October; no manure used. Variety of corn, Shoalhaven; quality very good; 120 bushels per acre. Points allotted—weight 60, quality 28, cultivation 10; total, 98 points.

Williamson Bros., Jasper's Brush, inspected 29th of April. Drills 14 chains long, and 53 in 5 acres (15 to the chain). Yield of cobs, 55 lb. per chain of drill; shrinkage 7 lb., loss by cores 8 lb. Yield of grain 40 lb. to the chain of drill, 560 lb. per drill, 29,689 lb. to 5 acres, or 530 bushels—equal to 106 bushels per acre. The cultivation of land was very good, drills even and straight. Corn planted the second week in October; no manure used. Corn, Horse-tooth. Points allotted—weight 54, quality 28, cultivation 10; total, 92 points.

Nelson Bros., Kangaroo Valley, inspected the 14th of April, 8 chains long by 6¼ chains wide. The number of drills 13 to the chain, or 81 drills in 5 acres. The yield was 56 lb. of cobs per chain of drill; shrinkage 8 lb., cores 8 lb., leaving 40 lb. of grain, 320 lb. per drill, 25,920 lb. in 81 drills, 462 bushels 48 lb. in 5 acres—equal to 92 bushels per acre. The quality of corn good, cultivation very fair. Corn planted early in October, and no manure used. Points allotted—cultivation 9, quality 28, weight 48; total, 85 points.

Thos. H. Nelson's crop, Glen Murray, Kangaroo Valley, inspected the 14th of April. Drills 13 to the chain; 8 chains 22 feet long by 6 chains wide; 79 drills. Yield, 54 lb. of cobs per chain of drill; shrinkage 8 lb., cores 8 lb., leaving 38 lb. of grain per chain of drill, 326⅔ lb. per drill, 25,016 lb. in the piece, or 446 bushels 40 lb. —equal to a trifle over 89 bushels per acre. No manure was used on this crop. Land a sandy loam, easily worked. Corn, Horse-tooth; planted early in October. Quality good, cultivation fair. Points allotted—weight 47, quality 28, cultivation 9; total, 84 points.

C. Blackwood, Terragong Swamp, inspected 15th April, 9 chains long by 5 chains 37 feet tested, giving 73 drills. Average yield, 56 lb. of cobs per chain of drill; loss by shrinkage 10 lb., by cores 8 lb. Yield of grain 38 lb. per chain of drill, 342 lb. per drill, 24,966 lb. to 5 acres—equal to 445 bushels 46 lb., or 89 bushels per acre. Planted second week in October. Variety of corn, Golden King. No manure was used. Land in very fair order, drills even and straight. Points allotted—weight 47, quality 28, cultivation 9; total, 84 points.

John Monaghan, Pyree, Shoalhaven, inspected 15th May, 10 chains by 5, containing 77 drills. Average yield, 47 lb. of cobs; loss by shrinkage 7 lb., by cores 8 lb. Grain yield, 32 lb. per chain of drill, 320 lb. per drill, 24,640 lb., or 440 bushels in 5 acres—equal to 88 bushels per acre. Time of planting, end of October. Variety, Old Shoalhaven. No manure used. Cultivation very good indeed, land in perfect order, drills even and straight. Points allotted—weight 46, quality 28, cultivation 10; total, 84 points.

J. Quilkey, Jasper's Brush, 10 chains by 5 out of 10 acres tested 29th of April; 17 drills per chain, or 85 drills in the piece. Yield, 44 lb. of cobs per chain of drill; loss by shrinkage 7 lb., by cores 8 lb.; 29 lb. of grain per chain, 290 lb. per drill, 24,650 lb.—equal to 438 bushels 22 lb., or nearly 88 bushels per acre. This crop was planted early in October. Variety of seed, Horse-tooth. No manure used. Cultivation very fair, drills straight. Points allotted—weight 46, quality 27, cultivation 9; total, 82 points.

Thomas Armstrong, Far Meadow, Berry, inspected 16th of April, 10 chains by 5 taken for test; 17 drills per chain, or 85 drills in the piece. Yield of cobs, 40 lb. average per chain of drill; loss by shrinkage 8 lb., by cores 6 lb. Yield of grain 26 lb., 260 lb. per drill, 22,100 lb., or 394 bushels 36 lb. in 5 acres, or 78⅘ bushels per acre. The corn was planted early in October. No manure used. Drills straight, cultivation fair, quality of corn very fair. Points allotted—weight 40, quality 26, cultivation 9; total, 75 points.

ABSTRACT—POINTS ALLOTTED.

1st—Mr. W. Anderson, Meroo, Shoalhaven	98	points	—1st prize, £6.
2nd—Williamson Bros., Jasper's Brush, Berry	92	,,	—2nd prize, £4.
3rd—Nelson Bros., Kangaroo Valley	85	,,	—3rd prize, £2 10s.
Thos. H. Nelson, Kangaroo Valley	84	,,	
C. Blackwood, Terragong Swamp	84	,,	
John Monaghan, Pyree, Shoalhaven	84	,,	
J. Quilkey, Jasper's Brush, Berry	82	,,	
Thomas Armstrong, Berry	75	,,	

(Signed) JOHN JAMES, Judge.

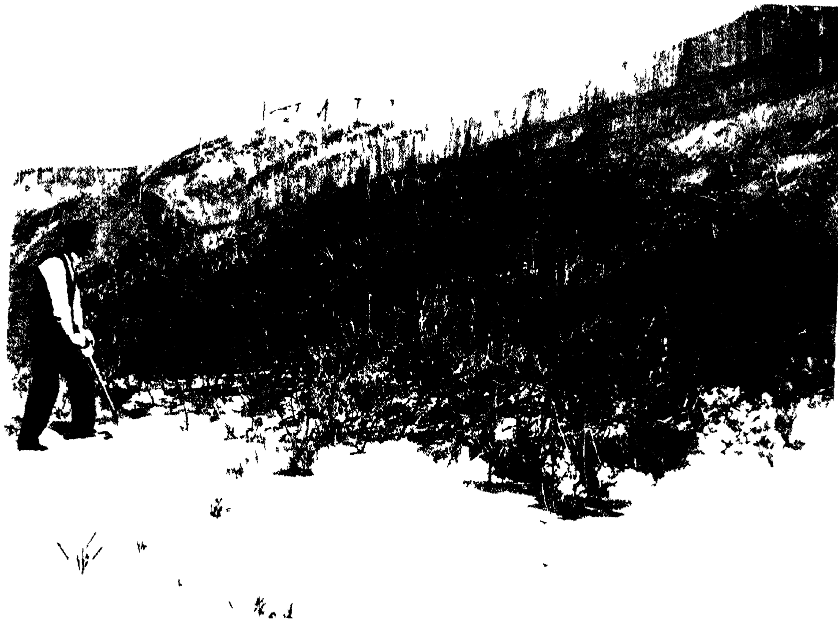
POULTRY FOODS.

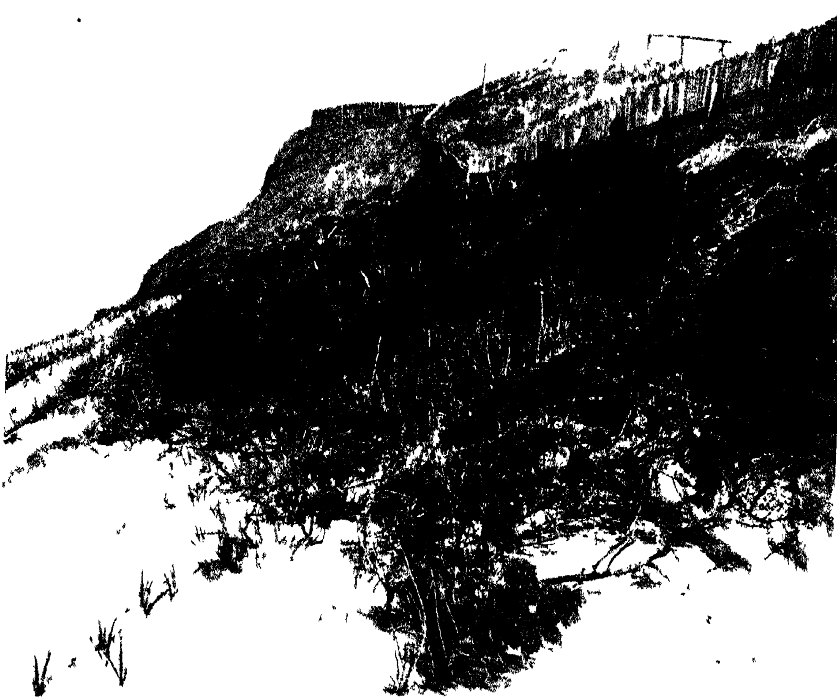
IN answer to a correspondent who asks for particulars of the rations supplied to poultry at the Hawkesbury Agricultural College, the Poultry Expert, Mr. D. S. Thompson, reports:—*Morning Meal:* Hot mash—two-thirds pollard, one-third bran, mixed with liver soup. *Evening Meal:* Maize and wheat alternately.

Cut-up liver fed out twice a week in the proportion of about 2 oz. per head. Green food once a week—lettuce or rape preferred. Fresh water daily, and shell grit constantly before fowls. Quantities fed—Mash, 1 pint for six head; grain, 1 pint for six head.

GROWING POTATOES IN DRY SEASONS.

MR. F. C. DYER, of Marulan, writes:—"In perusing the *Gazette* of this month, I notice Mrs. McDonald's method of growing potatoes, which no doubt is very good, simple and easy, so thought I would send you the method adopted by me, and which I think will commend itself to you and your numerous readers. The method is as follows:—If the tubers are large enough to cut I do so, but if not, just plant whole at a depth of 4 or 5 inches; cover well, and then cart old broken straw or other old material and scatter over till a depth of 5 or 6 inches is attained. My object in doing this is to form a mulch or covering to protect the soil from evaporation of moisture. The potatoes grow readily through this, and require no hilling or other treatment until fit to dig, then the mulch can be removed and potatoes dug quite easily and clean. I have practised this plan through all the droughts we have had, and have never failed in growing good crops of early sorts."





The Tamarisk.

W. S CAMPBELL

About 2 miles by road from the city of Newcastle, New South Wales, lies a place known as "the Sand-drift," where, until within the last few years, the sea-sand, from an exposed bay on the coast, used to encroach on the land in the vicinity to such an extent as to become a serious nuisance and almost impeding traffic on the main road.

One cause, and probably the chief cause, of the drift of sand in this locality was, doubtless, the removal of the native vegetation which at one time covered the country from the sea shore inland.

Great mischief is often caused by the reckless and thoughtless removal of timber and underbrush from places where a natural protection is of the utmost importance; but, unfortunately, such work is still in various parts of this State being carried on in a most heedless manner, and before many years are over, unless it be put a stop to in some way or other, immense damage to the whole country will result—but chiefly to the western districts, where, in my opinion, it is little short of madness to carry on wholesale destruction of natural vegetation.

Protective belts of timber and brush should be left in all districts throughout the country, and unless something of the sort be done, replanting will become absolutely necessary, or else the interior will become little if any better than the desert of Sahara, or the awful desert to which I shall refer later on.

About fourteen years or so ago the Government was obliged to take steps to arrest the drifting sand near Newcastle. The land in the neighbourhood was resumed, and the sandy bank along the sea beach was planted with Marram grass and Spinifex grass, and the top of the bank with such plants as *Pinus maritima, Ficus macrophylla, Metrosideros tormentosa, Lagunaria Pattersoni, Arundo donax*, Pampas grass, &c.

A few years afterwards a huge mass of sand, which was constantly drifting about from the property of the Australian Agricultural Company, was covered by the manager with waste shale, &c., from the coal-pits, and at the present time the sand-drift is a thing of the past.

About twelve years ago some small plants of *Tamarix gallica* were planted, not a great distance above high-water mark, at the foot of the bank which had been planted with Marram and Spinifex grasses, and it is with the idea of inviting particular attention to these plants that I am writing this article.

These plants grew well from the start, notwithstanding their exposure to most severe gales and strong winds, with constant encroachment of sand; and the place where they are growing is, I should think, one of the most exposed situations on the coast of New South Wales.

As the sand increased in height about the plants, so they grew up through it, and now appear, as shown in the photograph, a dense mass of foliage, varying from a few inches in height on the sea side to about 4 feet on the land side. The sand has increased about 12 feet in height since the young trees were planted, but it has not interfered with their growth, although the strong winds have kept the plants low and shrubby.

Under favourable conditions the *Tamarix gallica* grows into an ornamental and shapely small tree, or large shrub, attaining sometimes a height of 20 or 25 feet, and, when bearing its masses of small pinkish-coloured flowers, is singularly graceful and pretty.

It is not unfrequently known as the "flowering Cypress," although in no way related to the Cypress family. I have seen the Tamarisk grown for ornamental purposes in many places in New South Wales, and in the western districts it thrives remarkably well. In some of the excellent little gardens about the town of Hay it succeeds well, and when in full bloom becomes an exceedingly conspicuous and beautiful object.

I have no doubt that it, as well as other species, might be used with great advantage for wind as well as sand-breaks in places where such protection is becoming of more and more importance in the dry western country, for it will grow in any kind of soil, especially any soil that is of a saltish character.

A remarkable instance of the vitality of the *Tamarix* under most adverse conditions is given by Dr. Sven Hedin in his work "Through Asia," published 1898.

In his journey across the terrible sandy desert of Takla-Makan, the last vegetation he saw—that is, the plants which encroached the furthest into the desert—were the Tamarisk bushes; and the first he met with again, after passing through the worst of the desert, were the Tamarisk bushes.

"We were now entirely amongst the sand. The last of the Tamarisks which still defied the visitation of death was left behind. There was not a blade, not a leaf to be seen, nothing but sand, sand, sand—fine yellow sand—whole mountains of it stretching over boundless spaces, as far as the eye, with the field-glass to help it, was able to reach."

After travelling for days and days through similar country, at last:
"All of a sudden, Kasim stopped short, gripped me by the shoulder, and, with widely staring eyes, pointed towards the east, without uttering a word. I looked and looked in the direction towards which he pointed, but could see nothing unusual. But Kasim's eagle eye had discovered on the verge of the horizon the green foliage of a Tamarisk—the beacon upon which all our hopes of safety were now concentrated. We steered our course straight for the solitary tree, taking the utmost precaution not to lose its bearings. At length we reached it. Our first act was to thank God for bringing us so far safe.

"We revelled in the fresh greenness of the tree, and, like animals, chewed away at its sappy leaves. It was really alive. Its roots evidently went down to the water stratum. We were now within

TAMARIX GALLICA WITH SPINIFEX GRASS ON SEA BEACH NEAR NEWCASTLE.

TAMARIX ELONGATA IN THE GREAT SANDY DESERT OF TAKLA-MAKAN.

reasonable distance of open water. The Tamarisk shot up from the top of a sand-dune, and there was not a yard of flat, hard ground anywhere near it. A strange existence these Tamarisks (*Tamarix elongata*) lead. Their branches and tough elastic stems, seldom exceeding 7 feet in height, are bathed in burning sunshine; while their roots penetrate to an almost incredible depth, and, like syphons, suck up nourishment from the subterranean supplies of moisture. In fact, that solitary tree reminded me of a water lily swimming, as it were, on the billowy surface of the desert ocean. . . . . I gathered a handful of the leaves, which were not unlike the needles of the pine, and thoroughly enjoyed the sweet, fresh scent they gave off."

According to Professor Oliver, there are about forty-three species of Tamarisk. *T. gallica*, the species referred to as growing at the Sand-drifts, and also *T. ovicutalis*, produce galls which are sometimes used in medicine, and as dyeing agents, where astringent substances are required.

The plants of the genus, according to Royle, are distributed over a wide extent of territory in the Old World, in Europe and Siberia, and from the Caucasus and Senigambia on the west, to China on the East. They differ as much in their localities as in their latitudes, being found on the shores of the ocean, or the banks of rivers (as the Ganges or the Nile), as well as in the arid and sandy part of Northern India and the Punjaub, as in the cold and elevated climates of Thibet and Siberia, but in these the soil is saline.

The properties of the *Tamariaceæ* are considered to be bitterness and astringency, hence the occasional employment of the European species as a tonic, and a substitute for hops in making beer in Denmark. In India, also, the twigs of *T. indica* and *T. diocea* are considered astringent, but the plants are more valued on account of the galls that are found on them; other species, which, being highly astringent, are used in medicine and dyeing.

The ashes of *T. gallica* and *T. Africana*, when growing near the sea, contain a large proportion of sulphate of soda, so that they may be profitably burnt to obtain this salt; its abundance explains the utility of some of these plants as diuretics.

T. gallica grows on Mt. Sinai, and by the puncture of *Coccus manniparus*, a species of manna is produced, which is known by the name of Arabian, to distinguish it from the Persian manna, which is the production of *Alhagi maurorum*. The Tamarisk was a celebrated medical plant with the ancient Arabians, from whence the Latins seem to have borrowed the high encomiums they bestowed on its merits.

The Tamarisk is mentioned by nearly all the ancient poets. Homer states that it was the tree against which Achilles laid his spear before he plunged into the Œnanthus to pursue the flying Trojans.

"It was the custom of the Romans," writes Phillips, "to put wreaths of this flexible plant on the heads of criminals, and hence they mention it as the accursed or unhappy Tamarix."

Sheep are said to be very fond of its leaves and twigs, and this is probable, but I have not seen it confirmed. The manna of *Tamarix gallica mannifera*, above referred to, was supposed to be the manna

mentioned in the Old Testament, and which miraculously appeared in time to save the Israelites from starvation; but this idea has been quite exploded. Some information about manna given by Professor Kerner in his exhaustive work, "The Natural History of Plants" is so interesting that, although bearing but slightly on the *Tamarix*, I think it may be given here. Concerning the distribution of species by offshoots, he writes: "This brings us to the question of the much-discussed manna-rain in steppes and deserts, which, in reality, is nothing but the distribution of the offshoots of a lichen, viz., the Manna-lichen. This lichen, which was termed *Lichen esculentus* by the older botanists, but in recent times has been referred to the genera *Urceolaria*, *Lecanora*, *Chlorangium*, and *Spathærothallia*, and which, apparently, consists of three species, viz., *Lecanora esculenta*, *L. desertorum*, and *L. Jussufii*, is spread over an enormous region in South-west Asia, and extends as far as the south-east of Europe and the north of Africa. This lichen is met with in the neighbourhood of Constantinople, in the Crimea and Caucasus, in Persia, also in Kurdistan, Arabia, and the Anatolian Highland from Bulgar Daghi in the Taurus, and, finally, in the Sahara and the forests of Algeria. It first forms thick, wrinkled, and warted crusts on the stones, preferably on small fragments of limestone lying about. The outer colour of the crust is a greyish yellow, while on breaking it appears as white as a crushed grain of corn. As they get older, the crusts become rent and separate. either partially or wholly, from their substratum. When they first become loosened, the edges of the detached portion become somewhat rolled back. The rolling then continues, and, ultimately, the loosened piece forms an elliptical or spherical warted body, with very much contracted central cavity. Small stones are sometimes imprisoned in this way within the cavity of the sphere, in which case the weight of the loose lichen is correspondingly increased; but, as a rule, the hole is filled with air, and when dried the pieces weigh very little. . . . It is easy to see that the loose portions will be rolled about by the wind, and that a storm will sometimes sweep them up from the ground, and carry them hither and thither through the air. This method of distribution appears as the prevailing one in regions where the supply of water is not abundant in the rainy season, and where violent storms rage from time to time. That this is so is confirmed by the circumstance that the Manna-lichen, after the storms, lies chiefly piled up behind the low bushes and undergrowth., *i.e.*, just where the force of the storm has been to some extent broken, and where the shifting sand has been heaped up into little hillocks. Where a period of heavy rains succeeds the long dry summer, however, and where such a quantity of water falls on the parched land that it cannot all be absorbed, some of the rain collects in small rivulets. These carry away with them everything that is movable and capable of floating. The turbid rivulets flow down the inclined soil to the lowest parts of the country, and then unite into larger streams, or, if it can find no outlet, the water remains for some time in the hollows as small pools and puddles, and deposits there the mud and vegetable débris it has carried with it. The latter is more especially the case on the

steppe soil, overstrewn with small stones, where, between the slight elevations, there is a labyrinth of shallow channels and winding depressions resembling ploughed land. In such regions the Manna-lichen is chiefly washed into the depressions by the rain-water, and, in some years, in such quantity that it forms heaps a span high, and a single man can in a day collect 4 to 6 kilograms (about 12,000 to 20,000 pieces, varying in size from a pea to a hazel-nut). This is especially the case in the steppe region, and in the high lands of South-west Asia, where the Manna-lichen is used as a substitute for corn in years of famine, being ground in the same way, and baked into a species of bread. That the rain-water is the agent which transports the lichen in these regions is beyond doubt, because the pieces heaped up in the hollows are not in the least rubbed on their outer surfaces, as would certainly be the case if they had been rolled and dragged, even for only a short distance, over stony ground. It is also remarkable that all the so-called rains of manna, of which news has come from the East to Europe, especially those of the years 1824, 1828, 1841, 1846, 1863, and 1864, occurred at the beginning of the year, between January and March, *i.e.*, at the time of the heaviest rains. When we remember that the inhabitants of the district actually thought that the manna had fallen from heaven, and quite overlooked the fact that this vegetable structure grew and developed (although only in isolated patches, and principally as crusts on stones) in the immediate neighbourhood of the spots where they collected, we need not be surprised at the conclusion of our own peasants, who thought the tubers of the Lesser Celandine had fallen with the rain from heaven. It should be mentioned that the manna sent to the Israelites on their journey out of Egypt to the Holy Land is identical with the lichen described here; and the olden view that the manna of the desert was the sap of the Tamarisk (*Tamarix gallica mannifera*), exuded under the influence of a parasite, is without any foundation."

Barley Grass.

Mr. James C. Tibbits, of Myton Fields, writes:—"The general opinion here among stock-owners is that barley grass (or foxtail) is the best winter grass we have. They give it credit for qualities it does not really possess, overlooking the presence of other more nutritious substances not conspicuous to the casual observer, and hidden by this pretentious tall and thick-growing weed (barley grass). In one sense I quite agree with them. At the present time, it is the best winter grass we have, because nothing would eat it when more nutritious food could be obtained, and, therefore, it is the only grass 'left.' That fact, in my mind, proves that stock will not eat it if any other food can be obtained, neither will stock resort to mulga or any other kind of scrub if good feed is available. Before I read the analysis in the *Gazette* I was under the impression that foxtail was a good fodder plant, so much so that I was actually saving seed to sow on a tract of unimproved country. I at once desisted, and determined to make

careful observations of its growth, &c. Since then I have had every opportunity of doing so, as I occupy land on the Macquarie alluvial flats, where it grows to perfection. It is a very hardy plant, withstanding the effects of heat or cold; will germinate very quickly on a minimum quantity of moisture; very rapid in its growth in early spring. But in ordinary good seasons so do trefoil, wild carrots, prairie, crowsfoot, and other grasses intermixed with this foxtail, consequently the land is covered with a great coat of herbage. I have seen upwards of 60 head of good stores put on 150 acres, and in three months or so most of them taken out fat, and, apparently, plenty of grass still in the paddock, but I noticed the foxtail was left, comparatively speaking, untouched, the cattle having fattened on the trefoil and other more nutritious fodder plants. More cattle were put on but did not give the same satisfactory results. The succulent fodder had been exhausted, and nothing left but the now bleached foxtail, the seed having ripened and fallen. Then stock forced by hunger will eat it, as they will eat box or apple-tree leaves under like conditions. (At the present time cows and horses will greedily devour the droppings of the horses fed upon chaff.)

"I also noticed that on the headlands of the wheat paddocks it grew last season a great crop, yet when of early growth and apparently succulent the rabbits made tracks through it and cut the young wheat to the ground. When the wheat was garnered, horses and cattle were put on the stubble, and so long as a bite of stubble or anything else could be got this foxtail was left untouched. In one of these paddocks the foxtail prevailed, and was cut with the wheat and stacked. A buyer came out to buy. He exclaimed on inspecting this stack, 'I would not touch it at any price; too much grass among it!' This condemned stack was fed in sheaves to horses, and I took particular notice that if a sheaf had a quantity of this foxtail it was left, and only consumed when nothing better could be got. I send you a sample now standing on a vacant piece of ground to which horses and cattle have had free access, and rabbits in hundreds ring-barking the trees round which it grows. I consider it a weed which will eventually cause a lot of trouble, for it will smother and so take the place of fodder of a more nutritious character. It has other disadvantages, for its seeds will penetrate the eyes of lambs, causing blindness. Its capabilities of penetration may be quickly ascertained by walking through it, or by carrying a sheaf you will find your pants or singlet very irritating. It will also penetrate the gums of horses, and if not removed cause a lot of trouble extracting.

"I write this for the purpose of inducing some of your readers to prove that this foxtail is *the* best winter grass we have, and will not in the future eradicate more useful native and other grasses."

SEEDS FOR TRIAL AT WELLINGTON.

MR. T. BRUMMELL, of Suntop, reports that of the various seeds obtained last season for trial in the Wellington district, the cowpea was the only thing which stood the excessively dry weather.

Pruning.

(Continued from page 764.)

W. J. ALLEN.

Pear.

The general rules laid down for pruning other deciduous trees apply equally to this tree, which has, I think, received less attention from growers than any other variety of fruit-tree, in fact, wherever I travel I see trees which have been allowed to grow wild, and become useless, which, with a little careful attention (pruning, manuring, and cultivation), would have borne profitable crops for many years to come. It is often found now that when these old trees are cut back for grafting or other purposes they commence bearing again. Of the two forms, pyramidal or vase, I would prefer the latter shape for our conditions, although at one time I rather favoured the pyramidal, but from results obtained during the past five years, as well as for ease in fighting fruit pests, picking the fruit, pruning the tree, and working around, I am forced to the conclusion that the vase shape is the most suitable. Therefore, at the time of planting I would prune most varieties back to 18 inches in height. A few, with very spreading habits, may, with advantage, be left 6 inches higher, then proceed to train them in precisely the same manner as heretofore described. Thinning out the centre of the tree will require attention, and after the third year any shoots found growing along the branches may be pinched back to about 3 or 4 inches long to form fruiting wood, which should be left in such positions as not in any way to interfere with the growth of the upright branches, or what may be termed the framework of the tree. It may be found later on, as these branches increase in size, that they may become too thick; this can be easily overcome by the removal of one occasionally wherever or whenever it is thought advisable for the welfare of the shape of the tree. This is one of the advantages of the vase form, as there are several branches, and one or two of these can be removed without in the least affecting the shape of the tree, or in anyway harming it; in fact, as the tree increases in age, it is often found that to give proper space for all the limbs it is necessary to take one off occasionally.

Any grower of pear-trees will observe that after the tree has attained a good age, and has borne heavy crops of fruit, that instead of putting on the superfluous unproductive wood which it was wont to do while young, it expends its energies in throwing out fruit-spurs all over the tree, which, if they are all left to blossom, will in all probability prove too great a strain on it, and the chances are that the tree may set only a light (if any) crop. It is best, therefore during, each winter pruning to go over the whole of the tree, thinning out

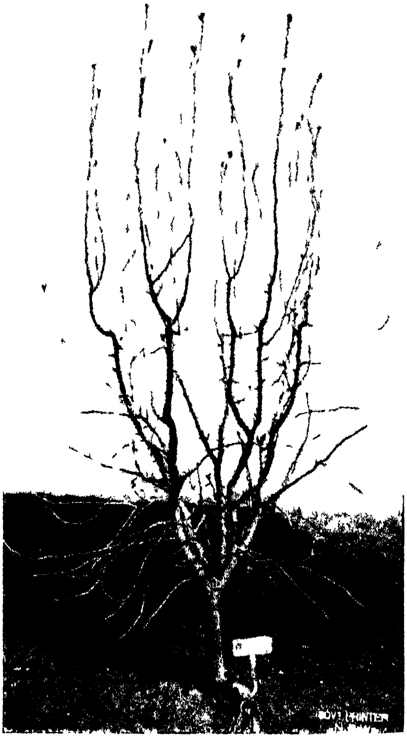


Fig 85


Fig. 86

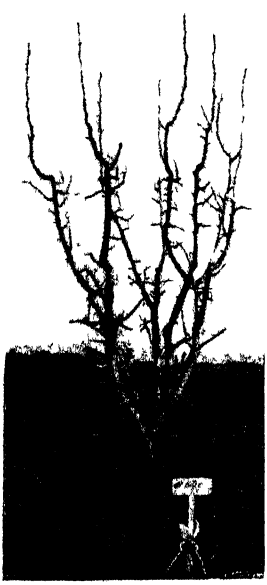


Fig 87.

such spurs, and leaving about as many as the pruner considers will be sufficient for the tree to carry, so as to ensure a good set of fruit without in anyway overtaxing its strength. If this system is followed up regularly from year to year it will secure for the owner good crops of fruit of the very best quality, and a long-lived tree, which is in every respect the object to be desired. Some varieties of pears do not start bearing at a very early age, and in some districts we have varieties which will never do well; in such cases it can hardly be expected that pruning will have the desired effect.

As a rule, greater profits are secured by regular annual crops than by heavy alternate ones, as it commonly happens that such seasons are the very ones when fruit is plentiful and cheap, and the profit in handling it very small.

Fig. 85 is a four-year old "P. Barry" pear-tree before pruning, while Fig. 86 is the same tree after pruning, and Fig. 87 is the tree taken early the following summer, showing the fruit on the tree.

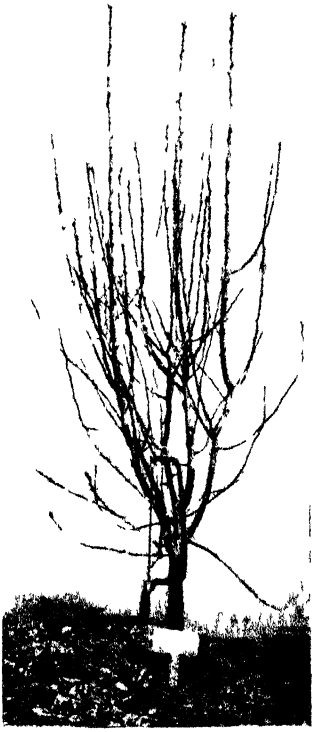


Fig. 88

Fig. 89

Fig. 88 is a Bartlett pear (three years old) before pruning. Fig. 89 is the same tree after pruning, and Fig. 90 is the same tree two years later before pruning, while Fig. 91 shows the tree pruned.

Fig. 91

Fig. 90

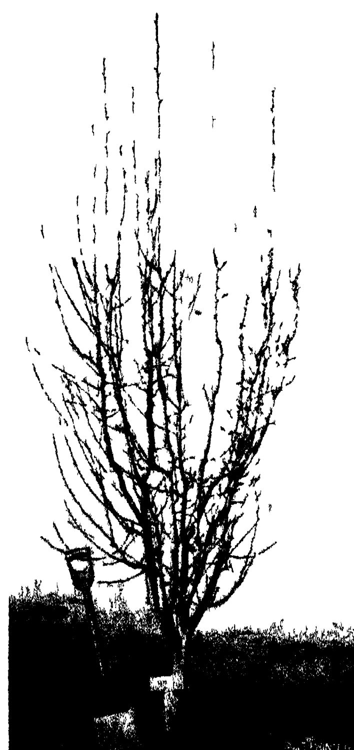


Fig. 92

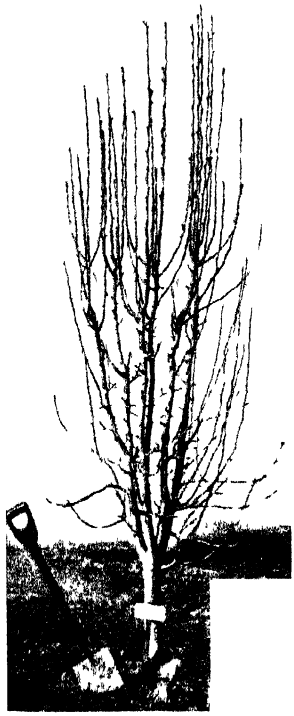


Fig. 93.

Fig. 92 is a Beurré Clairgeau pear carrying fruit, showing its habit of growth; Fig. 93 shows the tree before pruning; while Fig. 94 depicts the same tree pruned.

Fig. 95 is a Howell pear before pruning. It will be observed that this is naturally a well-shaped tree, and easy to prune when once it is shaped. Fig. 96 the same tree after pruning, and an exceptionally well-shaped tree.

Fig. 94.

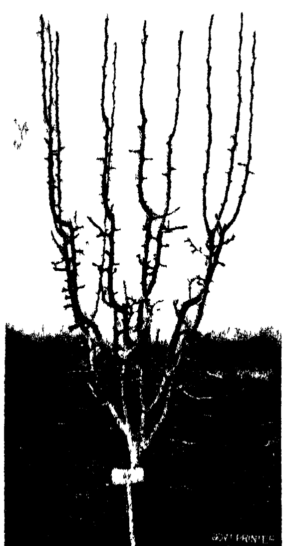


Fig. 96.

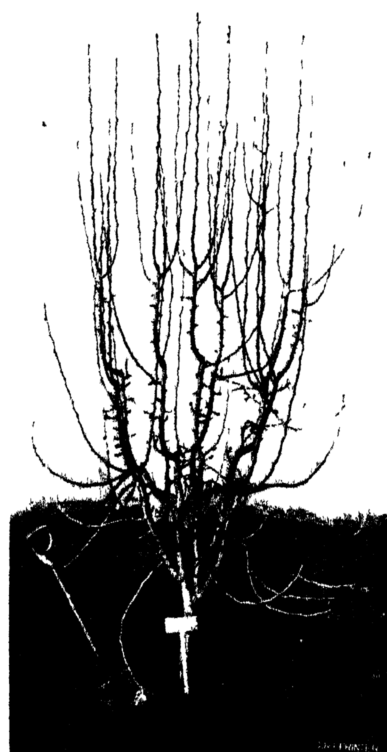


Fig. 95.

I will give one other variety of pear in all its stages of pruning, together with results. The different cuts shown, taken at the different stages of the work, should be of great assistance to the amateur, and prove of great service during the pruning season. Fig. 97, a "Kieffer's Hybrid" tree before pruning. This tree is a strong grower, and has thrown out a good many lateral and leading shoots. Fig. 98 is the same tree pruned,

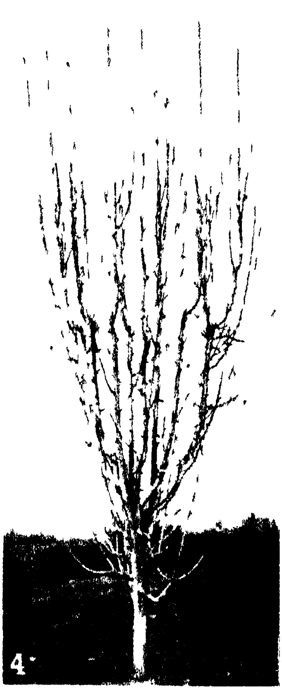


Fig. 97

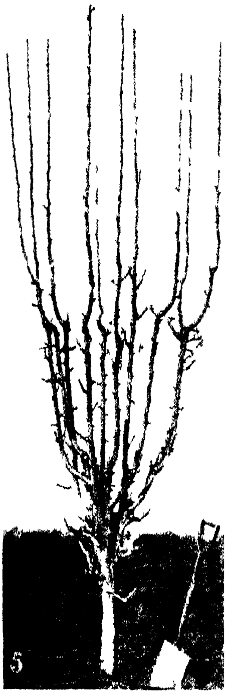


Fig. 98

with the exception of shortening back the leaders. Fig. 99, the tree as it looks when finished, and Fig. 100 the tree a few months later, carrying fruit.

It has been claimed by some that officers of the Department have plenty of theoretical but not enough practical experience, and such figures as these will demonstrate that theory can be, and is, put into practice in our Government orchards.

Fig. 100.

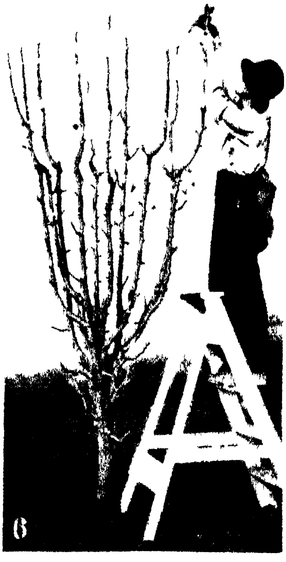
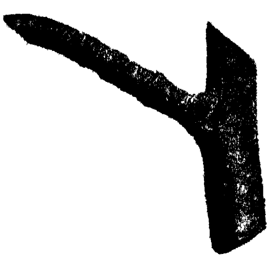


Fig. 99

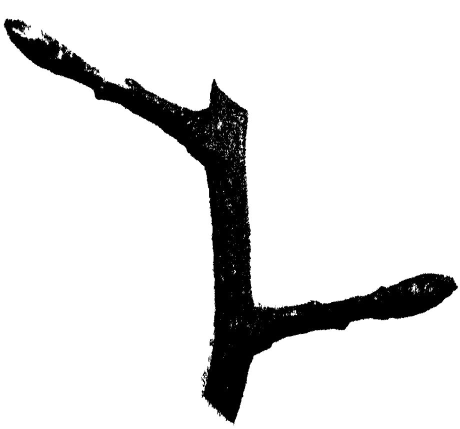
Fig. 101 is (A) a pear cutting of wood of this year's growth, with only leaf-buds showing, while (B) is a cutting from a three-year old tree, also showing leaf-spurs. The spur (*c*) carried a fruit last season and also threw out the spurs (*d*) and (*e*), the former being a fruit and the latter a leaf-spur. All the other spurs showing in the illustration are leaf-spurs, so that the prospect for fruit on this particular piece of branch is limited to only one fruit. The leaf-buds may generally be distinguished from the flower-buds in that the former are very pointed while the latter are large and rounded.

It is well to remember in pruning pear-trees that while as a rule the fruit-buds are rounded or blunt at the point, in some varieties of pears the buds that produce the fruit are quite pointed, as shown in the following examples.

B



Easter Beurré.



Onondaga

Alexander Lambré

Le Conte.

The Cherry.

While the same general rules which apply to other fruits also apply to the cherry, yet it will be found best to modify the treatment in some of our warmer districts, and in those where the soil is not altogether favourable for their growth, as we find in many places that if too severe pruning is practised after the second or third year the tree is apt to gum badly, and perhaps die.

In some districts, particularly where the soil is of a deep, rich basaltic formation, gumming is not so prevalent, and the trees do much better. Many of our old growers have not followed very drastic methods of pruning after once the tree was well established, with, in many instances, fairly good results. However, this neglectful system, or, I should say, want of system, cannot be recommended, as a certain amount of thinning out and nipping back is always necessary, and, perhaps, more for the first few years than later. This is best done while the tree is growing, either just after the fruit is picked or just as the buds are bursting in the spring.

In removing part of a shoot or branch, always cut back to a leaf-bud or a new shoot, but never to a fruit-bud, as it is difficult to get the latter to throw out good wood. In starting branches out of the trunk of the tree, care must be taken to see that they are at good distances apart from each other, and that they start more at right-angles than in a triangular shape.

Fig. 102 is a three-year old cherry tree which has only been winter pruned twice.

Fig. 102.

Fig. 103

Fig. 104.

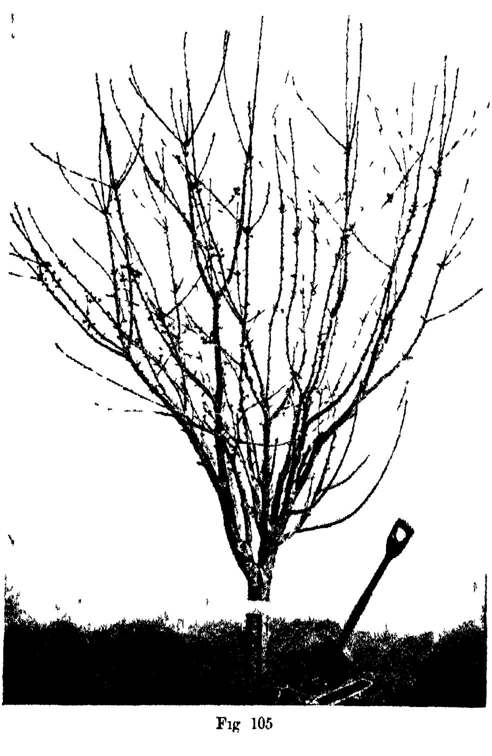


Fig 105

Figs. 103-4—a "Centennial" tree, four years old, before and after pruning. It will be noticed that very little has been taken off during the winter pruning.

Fig. 105 is the same tree a year later, before pruning, which will not be done before the buds begin to burst in the spring.

Fig. 106 is a "Belle Magnifique" cherry-tree in full bloom.

Fig. 106.

It will be seen that all of these trees have been pruned so as to form a low head when young, but latterly they have not been cut back severely.

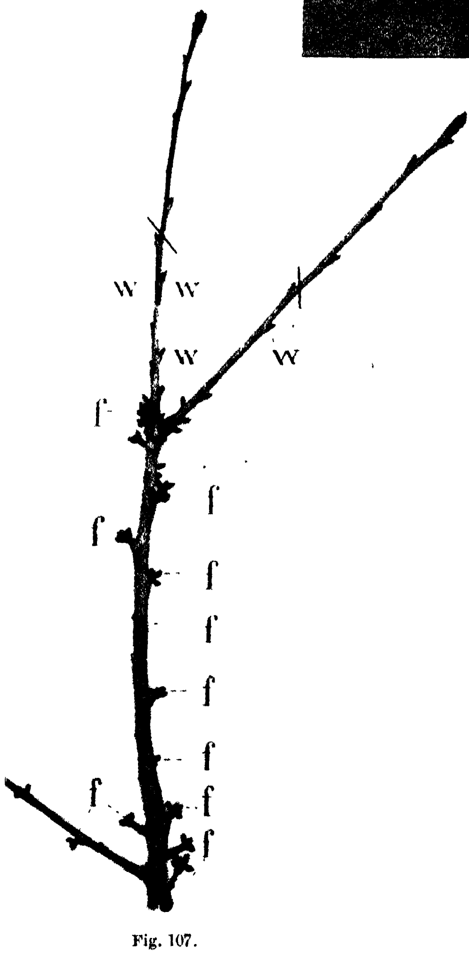


Fig. 107.

Fig. 107 is a cherry-tree branch unpruned, showing wood and leaf buds, as also fruit-buds, with lines drawn across the terminal shoots, showing where to cut. It is easy to distinguish where the division line is between the two seasons' growth.

(f) Signifies fruit-buds.
(w) ,, wood-buds.

Fig. 108 shows cherry-buds on spurs and last year's wood. Beginning with A, on the left-hand side is a leaf-spur, while on the top is a fruit-spur which has borne fruit two years, and has at present six fruit-buds with a leaf-bud in the centre. This will extend, and around it will be clustered the fruiting buds a year later, just as at present its point has the fruiting buds clustered around it. B depicts two-year old growth of the cherry, the division between the two and one year old growth being where the line crosses the shoot. Below the line are found clusters of buds on spurs, while above the line the buds are single. C shows wood of two and three years' growth, the division

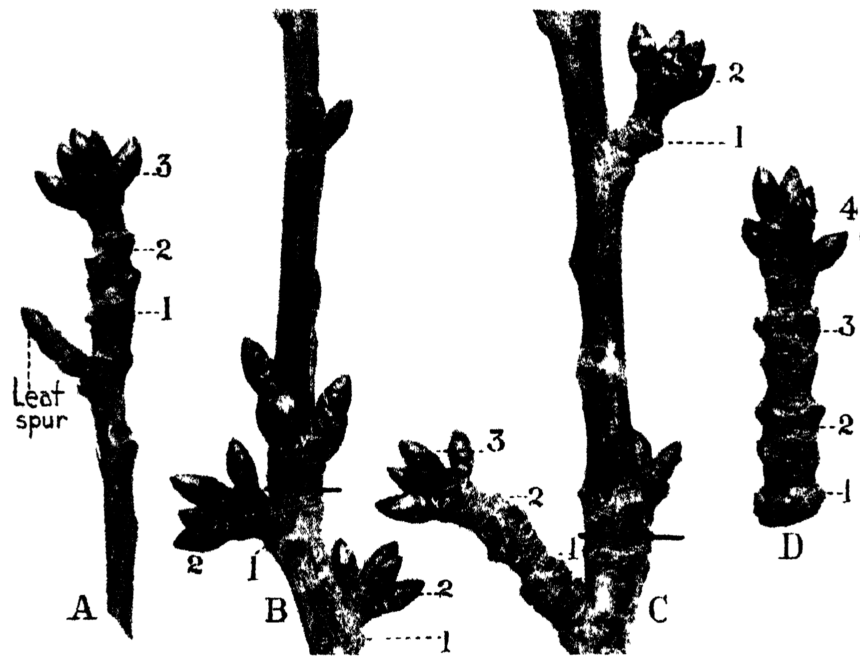


Fig. 108.

being where the line crosses the shoot, and D is a four-year old fruit-spur. On examining this spur, it will be found that at the very base there is a circle of rough bark, followed by a smaller circle of more even growth, this habit of smooth and rough growth being repeated from year to year. Each of the uneven circles on the spur represents where a season's crop of fruit has grown. When the season's crop is removed from point 4 it will resemble in every way point 3. Thus it will be seen that there is no difficulty in telling the age of the fruiting wood on branches.

The Fig.

This tree when set out should be cut back, leaving a trunk 30 inches long, from which three laterals may be allowed to grow. At the second winter's pruning six main branches may be left, and from this time on very little heavy pruning will be required. Where the trees are healthy and growing well the inclination is to throw laterals, those on the outside often having a downward tendency. These should be removed, as also any shoots or growth growing too thickly through the centre and top of the tree. It is best to cut back to another shoot or branch rather than merely cutting away a part of the shoot. This method is best explained by referring to Fig. 109, which shows a fig-tree before pruning, while Fig. 110 is the same tree after pruning. Figs. 111-12 again show the same tree a year later, both before and after being pruned.

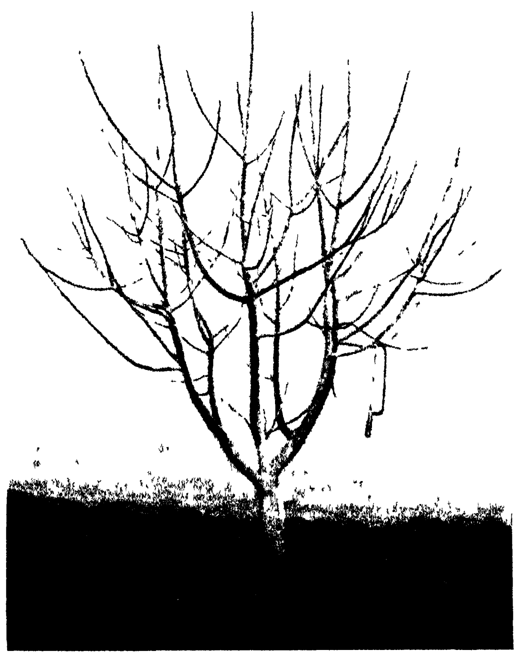


Fig 109.

In forming the head, six main branches are quite sufficient, and a less rather than a greater number would be preferable. Plenty of shade must be given, yet sufficient light must be admitted to properly ripen the fruit.

In California, where I have grown figs under irrigation, I found that the trees cropped heavily every year without much pruning, and apparently the fruit suffered no ill effect from its neglect. In this State, where the fig is grown without irrigation, it would be advisable to keep to a low-headed tree, but in those countries where the fruit is grown for drying they are kept up a certain height, as it is necessary to move about underneath the tree to pick up the ripe fruit, which falls when ripe in the case of properly fertilised figs.

In his article on "The Fig: Its History, Culture, &c.," Gustav Eisen, Ph. D., says: "Most fig-trees suffer if their branches are cut squarely back. In all old fig-growing countries, even in England, the saying is: 'A fig-tree cut back will give no good crop!' This has also been the experience in California, especially with heavy growing kinds. The writer has known an instance where large fig-trees, which were cut

back for cuttings, did not again bear good figs, and several similar instances have been reported where for ten years the trees did not recover their producing power. After the first year, therefore, the fig-trees should only be thinned out. Never cut back the fruit-bearing branches in such a way that the same branch can send out side shoots below the cut. If cutting be necessary in order to shape the tree, cut back to the fork in such a way that the whole branch will be cut off either to the main trunk of the tree or to a main branch, and let it be remembered that the less heavily the fig-tree is pruned the better for the bearing quality of the tree, and the better for the quality of the fruit. When cut off squarely a branch sends out side branches from a number of eyes immediately below the cut, and the end of the branch will look somewhat like a brush. These side branches will interfere with one another, and with other branches of the tree, and most of them must be cut away the following season, in order to shape the tree, and to admit air, light, and heat. But if the branch in question be cut off further down close to a fork, the remaining branch of the fork with its terminal bud will lead off the sap, and the brush-like formation will not take place. In other words, after a fig-tree has been necessarily pruned, every branchlet as well as every branch should possess a terminal bud, in order that the new branch system may consist of fairly parallel branches. With this point steadily in view, the next consideration will be that of pruning bearing trees. Unlike other fruit-trees, the quality and size of the fig is not improved directly by heavy pruning, except in cases where fig-trees are grown in pots or against walls. A fig-tree with many branches will bear as large and as fine fruit as a fig-tree with few branches. Indeed, it will, as a rule, bear larger and better fruit. The effect of pruning is, therefore, generally not to increase the size and flavour of the fruit. Still, it cannot be denied that the proper pruning of old and heavy growing fig-trees will improve the quality of the fruit indirectly, though not exactly in the same way as in other fruits. The fig must be pruned in order to admit light, heat, and air, and to prevent crowding and bad shape and the interference with other crops grown among the trees. If the fig crop is the principal one

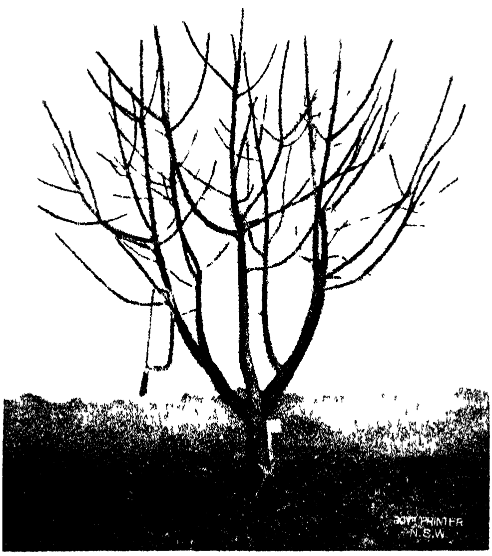


Fig 110.

the latter consideration must be secondary only. Heavy growing fig-trees such as Adriatics, &c., produce better and larger figs if pruned; but this pruning must consist in simply cutting off the young year's wood whenever several branches start out too close together from the same limb. Thus in the above variety the young bearing wood should be at least 2 feet long without side branches. All other twigs may be cut off close to the main branch, but never cut off squarely or simply cut back. Only cut them off close to the mother branch, as the latter will then bear better and larger figs. The pruning of the fig, when grown in the open, should be confined to three or four distinct points. The sterile twigs generally found at the base of the main branches should be cut off each year. These twigs are generally bent downward, are slender, and seldom bear fruit. Larger, as well as smaller, branches which cross one another should be so cut out that no further interference is possible. The centre of the tree in thick-growing varieties

Fig. 111.

Fig. 112.

should be thinned-out or cut entirely away in order to admit sun, air, and light. Lower branches too close to the ground should also be cut off close to the main stem or main branches; and, finally, if a tree is unevenly balanced, the branches on the larger side may be cut back in order to properly balance the tree. But in all these operations all cuts should be made to a fork, and the cut branch should never be without a leader.

"And, finally, in any heavy growing and bearing varieties the side branches of the yearling wood may be cut off close to the stem. As to the time of pruning, the best time is when the leaves have fallen and the fig-tree is most dormant. Some sap will always flow, but the more dormant the tree the better.

"The final question, whether high or low standards should be given to fig-trees, must be entirely dependent upon climatic conditions and other circumstances. In moist ground the figs should have a high standard, in order to admit the necessary air and light, especially so in localities where the souring of the figs is a common evil. On the contrary, in places where moisture is scarce, and where the figs may suffer from drought, the low standard should be adopted, with side branches sloping closer to the ground and shading the soil. Consideration should also be had for the variety, and, as a general rule, it may be said that figs for drying require higher standards than those grown for table only. The high standard may be considered at once when the trees are first set out, as has been already remarked; but a change from low to high standard may be readily accomplished later and gradually, without any great difficulty or injury to the tree. In Smyrna the branches reach the ground within 3 or 4 feet, while from the main root three or more standards start out at sharp angles to the ground."

The Almond.

At time of planting this tree should be cut back to a height of 18 inches, and treated in every way the same as the nectarine until after it has attained the age of 4 years, when it may be allowed to grow with but little interference, except that the centre must be kept from crowding, cutting out all cross limbs and removing one occasionally where found growing too thickly.

The tree is generally planted to act as a breakwind around orchards in our warm dry districts in the interior, where it crops well, but in the coastal districts it has not proved an unbounded success. It is very unusual to find the almond planted in orchard form, as it rarely returns the grower sufficient to warrant planting it at all extensively.

Fig. 113 shows the method of growing this tree as a breakwind around one of our experimental orchards. Although the trees are in full bloom, it can be seen that they have good sturdy trunks and main branches, and are pruned in such a manner as to allow the horse and cultivator to work close up to the tree. If they had been growing in orchard form I should have removed a little more of the wood from the centres of the trees, in order to give that portion a little more light, but I would not cut the tops back to any extent.

Fig. 113

Fig. 114

Fig. 115.

Fig. 114 is an almond-tree in the Departmental orchard before pruning. The tree is five years old and has borne fruit for two years. Fig. 115, the same tree after pruning.

Fig 116

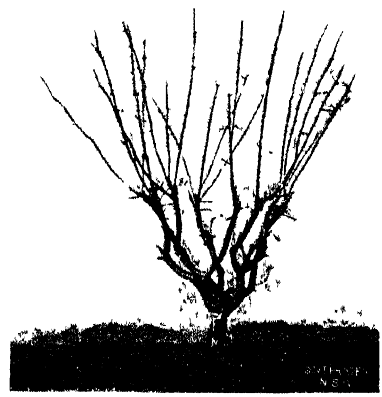


Fig 117

Fig. 116 is an almond-tree before pruning. Fig. 117, the same tree after pruning.

The Persimmon.

This is one of the varieties of fruit-trees which has been pretty well neglected by the pruner, yet to obtain anything like best results the tree must receive its annual thinning and shortening back. While I would not recommend opening out the centre of the tree to quite the same extent as many other varieties of fruit-trees, still the new growth requires to be kept properly cut back and thinned each year, and all dead limbs removed as well as those found to be filling up the tree or crossing each other. In the April, 1899, Bulletin issued by the University of Tennessee Agricultural Experiment Station, Mr. W. A. Yates, of Texas, who has 2,000 trees, recommends cutting back the previous season's growth one-half, and the training of low pyramidal heads. "Thinning is an essential operation when a considerable quantity of the fruit does not drop prematurely. The Japanese persimmon is exceedingly productive, and thinning is important for the following reasons:—First: To secure larger and finer fruits. It would be unreasonable to expect each one of the numerous fruits found on some trees to attain a large size. Second: To promote longevity. A prominent grower of Florida believes that overbearing kills 60 per cent. of all the trees in the south that die from various causes. Third: To secure annual crops of uniform proportion. A

tree which overbears one year is not in condition to yield even a fair crop the following year. Thinning should be deferred until the fruit is at least 1 inch in diameter. Removing the surplus specimens at this time will not result in overthinning, as premature dropping usually occurs before the fruit has attained the size mentioned. Thinning is especially important for very young trees."

Fig. 118.

Fig 118 is a four-year old persimmon-tree before pruning.

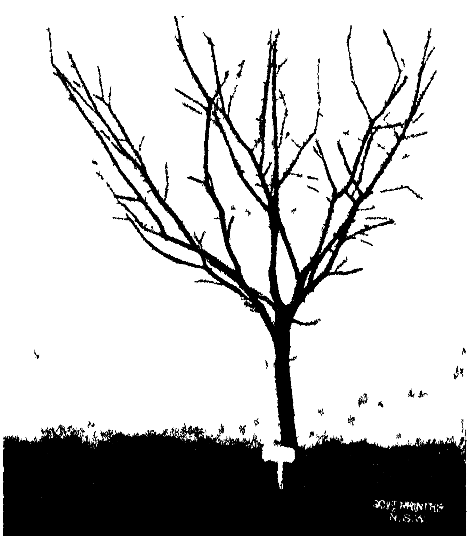


Fig 19

Fig 119 is the same tree after pruning.

Passion Vine

As very little attention has been paid by writers to the pruning or otherwise of this vine, it will not be out of place to show cuts of it on the trellis at different ages, and to explain the nature of those which find most favour with the grower. I think I am not far out in asserting that there is more of this fruit grown in New South Wales than in the rest of Australia and America put together, and if we could succeed in putting it on the European and American markets it would not be long in finding favour, and there would be created an unlimited demand for it.

The vine is grown from either seeds or cuttings, which, as soon as they are well rooted, are planted out in vineyard form 12 x 16 feet or 16 x 16 feet apart. The trellis is erected, the tops of the posts projecting 5 feet out of the ground and 24 to 36 feet apart, on top of which is stretched, 6 inches apart, two strong No. 8 wires. The young vine is trained with a single stem up a light round stake until it reaches the wires, when it is allowed to throw out from two to four

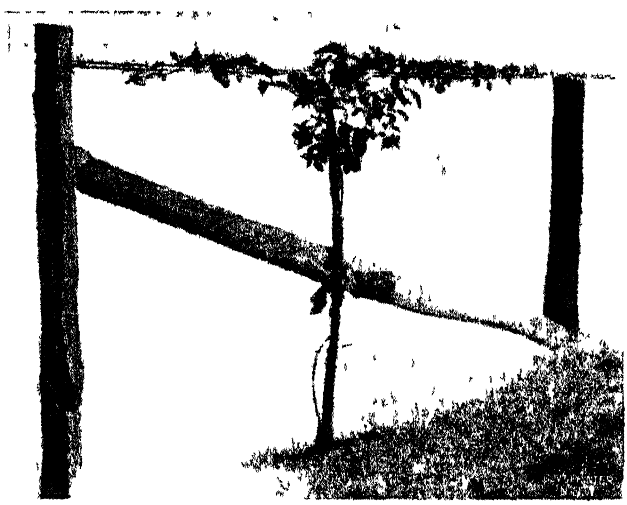


Fig. 120.

leaders, which are trained to run either way on the wires, see Fig. 120, which is a vine a year after planting. As the vine grows it is trained along the wires, and as it increases in age these main leaders throw out more laterals, and at 2 years old it presents the appearance of Fig. 121, which, it will be observed, is carrying a crop of fruit; but as this depicts only a portion of the vine a better idea may be formed of the condition of the vineyard by referring to Fig. 122, where several vines in the row can be seen.

About the first week in November of each year will be found the best time for pruning this vine, which process consists in cutting back

Fig 121

all growth to within about 1 foot from the wire on the underneath side, and if the vines are old and very thick along the wires it will be found advantageous to thin out at least half of the remaining portion.

Fig 122.

By pruning at this time of year the early crop may not be very heavy, but the winter crop will make up for the shortage, always, of course, provided the vines are well cultivated, manured, and not growing in a locality where they are subjected to heavy frosts.

(To be concluded next issue.)

Universal Nomenclature for Wheat.

[Continued from page 418.]

By N. A. COBB.

THE encouragement from the foregoing results was sufficient to lead to the examination of a series of samples grown in 1893.

The results of this examination are given in the following table. A discussion of these results and a comparison of them with those of other years will follow in due course. It is only necessary here to again call attention to the fact that while the present table is derived in a manner similar to that for 1895, it cannot be unreservedly compared with the latter for the reasons that have been already explained.

VARIETIES of Wheat arranged according to the nature of the Aleuron layer, Carbolic Acid method.

	Area occupied by the cell walls. radial view.	Area occupied by the cell walls. radial view.		Area occupied by the cell walls. radial view.	Area occupied by the cell walls. radial view.
	per cent.	per cent.		per cent.	per cent.
Red Straw	33·4	66·6	Canning Downs... .	26·4	73·6
Rattling Jack	32·2	67·8	Little Club	26·2	73·8
Galland's Hybrid ...	31 2	68 8	Fillbag	26 0	74·0
Northern Champion ...	29 7	70·3	Sicilian Square-headed Red	25 8	74·2
Steer's Early Purple Straw	29·7	70·3	Early Para	25·7	74 3
Californian Spring ..	29 6	70·4	Pringle's Defiance ..	25·3	74·7
Thomas R. R.	29·5	70·5	Battlefield	25 2	74·8
Fultz	29·5	70·5	Saskatchewan Fife	24·9	75·1
Talavera de Bellevue ...	29·3	70·7	Darblay's Hungarian	24·7	75·3
Rieti	29·1	70 9	Zealand	24·7	75·3
Velvet Pearl	28·9	71·1	Ward's Prolific	24 5	75 5
Rattling Jack	28·7	71·3	Hedgerow ..	24·4	75 6
Australian Talavera ...	28·5	71·5	White Velvet	24 2	75·8
Blount's Lambrigg ...	28·3	71·7	Improved Fife	24·1	75·9
Golden Drop	28·2	71·8	Bearded Herrisson	24·0	76·0
Dutoits	27·9	72·1	Egyptian Mummy ..	23·9	76·1
Frampton	27·4	72·6	Belatourka	23·8	76 2
Smith's Nonpareil .	27·3	72·7	White Lammas... ..	23·8	76 2
King's Jubilee	27·3	72·7	Algerian..	23·3	76 7
Early Baart	27·2	72·8	French Early Bearded...	22·8	77 2
Rattling Tom	27·2	72·8	Oakshott's Champion ...	21·9	78 1
Velvet Pearl	27·1	72·9	White Essex	21·8	78·2
White Fife	27·0	73·0	Robbins' R. R.	21·8	78·2
Leak's R. R.	26·8	73·2	Medeah	21·5	78·5
Dallas	26 7	73·3	Poland	21·0	79·0
Farmer's Friend... ..	26·6	73·4	Marshall's No. 8. ...	20·5	79·5
Allora Spring	26 5	73·5			

Darblay's Hungarian | Zealand | Ward's Prolific

Hedgerow | White Velvet | Improved Fife

Bearded Hérisson | Egyptian Mummy. | Belatourka

White Lammas | French Early Bearded | Oakshott's Champion

Robbins' Rust-resistant | Medeah | Poland

Sections of Aleurone Layers of Wheat.

PLATE X.

Rattling Tom — Velvet Pearl — White Fife

Leak's Rust-resistant — Dallas — Farmer's Friend

Allora Spring — Canning Downs — Little Club

Fillbag — Sicilian Square headed Red — Early Para.

Hindley's Defiance. — Battlefield — Saskatchewan Fife

Sections of Aleuron Layers of Wheat.

PLATE VI.

Red Straw | Galland's Hybrid | Northern Champion

Steer's Early Purple Straw | Talavera de Bellevue | Rieti

Rattling Jack | Australian Talavera | Blount's Lambrigg

Golden Drop | Dutoits | Frampton

Smith's Nonpareil | King's Jubilee | Early Baart

Sections of Aleurone Layers of Wheat.

PLATE VII.

Hand-feeding Sheep.

F. B. GUTHRIE.

The following notes are a contribution to the discussion of the question of the feeding of sheep by artificial means—that is, by food other than that naturally provided by the pastures.

The question has unfortunately become one of vital importance to the community, since, owing to the present severe and long-continued drought, the natural food has practically disappeared in the larger part of the pastoral area, and it has become necessary, in order to keep stock alive, to purchase fodder and to feed by hand. Nothing is better calculated to impress the mind with the awful nature of the present drought, than the fact that on the majority of stations in New South Wales the artificial feeding of stock has been resorted to for the past three months or more, and that even if rain should immediately fall, the practice will nevertheless have to be continued for at least another two months until the grass is sufficiently forward to provide the necessary nutriment. The question in its many aspects has been discussed from several points of view, by men engaged in the breeding of sheep, by merchants and business men, by philanthropists and politicians; but I am not aware that any attempt has been made to approach the question from the strictly economic side, taking into consideration the actual amount of nutriment necessary to keep sheep alive and the cheapest means of providing that nutriment.

The difficulties connected with the choice of fodders have become greater owing to the scarcity and dearness of suitable food, brought about by the dry season.

It is also unfortunate that in most cases those who are thus unexpectedly confronted with the necessity of providing rations are without experience in this direction, and are not aware of what constitutes a ration on which an animal can exist, and have first to learn this by bitter experience.

It is in the hope that a discussion of the matter from the standpoint of the knowledge we possess as to the actual food requirements of sheep may be of benefit in enabling us to devise the most suitable and economic rations, that I submit the following notes to readers of the *Gazette*.

I have obtained through the courtesy of some of the principal pastoral agents in Sydney particulars of the rations employed by station-holders with whom they are in correspondence, and I propose to discuss and criticise some of these rations.

The ingredients which are to be taken into account in compounding feeding-rations are (1) nitrogenous material, which will be shortly classed as *albumenoids* (these are substances of a nature similar to that of gluten in wheat, and are popularly known as "flesh-formers"); (2) *carbohydrates*, a name given to substances of the nature of starch and sugar, and (3) *fats and oils* (these two latter classes being known as "heat-producers"). In addition to these, which constitute the nourishing portion of the food, animals like sheep

require a certain bulk in their food, material like cellulose or fibre, which is not digested to any appreciable extent, but which plays an important part in the mechanical distribution of the food. Water is, of course, also essential. It has been ascertained that it is necessary, in order to keep an animal alive, not only that the total amount of nutritive material—albumenoids, carbohydrates, and fat—shall not fall below a certain point, but that a definite ratio must exist between these ingredients; that is to say, that a food like molasses, which is very rich in sugar, is unable by itself to sustain life, unless it is mixed with feed rich in albumenoids. This ratio, known as the *albumenoid ratio*, may vary in the case of sheep (as will be seen by the following table) between 1 part of albumenoids to 5½ parts carbohydrates up to 8 parts carbohydrates. The palatability of the food, and the benefit of as much variety as possible, are also important factors, though less capable of accurate determination than their nutritiousness.

The usually accepted feeding standards are those devised by the German chemist, Wolff, and are the result of careful and elaborate experiments. The following is the maintenance diet for sheep given by him, and quoted in most text-books:—

MAINTENANCE—DIET FOR SHEEP.

Expressed in pounds per head per day.

Weight of sheep.	Age (months).	Total dry matter.	Albumenoids.	Soluble carbohydrates.	Fat.	Total nutrient matter.	Albumenoid ratio.
56 lb.	5 to 6	1.6	0.18	0.87	0.045	1.095	1 : 5½
67 lb.	6 to 8	1.7	0.17	0.85	0.040	1.060	1 : 5½
75 lb.	8 to 11	1.7	0.16	0.85	0.037	1.0[illegible]7	1 : 6
82 lb.	11 to 15	1.8	0.14	0.89	0.032	1.062	1 : 7
85 lb.	15 to 20	1.9	0.12	0.83	0.025	1.047	1 : 8

The figures for weights corresponding to the different ages refer to European conditions, and will be found to be somewhat higher than our weights at the present time. The table indicates the lowest possible quantities of the different ingredients required to keep sheep in healthy condition, not breeding nor fattening.

The "albumenoid ratio" is the proportion between the amounts of albumenoids, or nitrogenous food, and the sugars, starches, and oils. It will be noticed that this ratio is much narrower in the case of young growing sheep (which require a larger proportion of albumenoids) than with mature animals, which latter only require sufficient material to repair waste of tissue. The younger animals also require their food in a more concentrated form, the quantity of nutrient matter required being greater, although the total dry matter (including undigested material, such as fibre) is less than is required in the case of full-grown sheep.

It is, however, becoming generally recognised that the ratio recommended by Wolff is, in most cases, too narrow a one; that is to say, it requires too high a proportion of albumenoids. This is notably the case with adult animals, and in the case of sheep it has been proved that they can be successfully fattened on a ration containing relatively much smaller proportions of albumenoids than those recommended by Wolff, and on a much less generous ration.

In an article contributed to the *Agricultural Gazette* by Mr. T. U. Walton, Chemist to the Colonial Sugar Company (*Ag. Gaz.*, vol. ix, page 169), experiments are quoted showing that, in the case of horses doing hard work, a ration containing only half the amount of albumenoids required by Wolff's standard was found to be entirely satisfactory.

In the case of growing animals a larger proportion of nitrogenous material is necessary to meet the requirements of growth, and this applies also to breeding animals and to milch cows. In composing a maintenance diet—that is, a diet which will keep an animal in a healthy condition which does no work and is not breeding nor producing milk the amount of albumenoids required by the German standard is undoubtedly excessive. Experience will also show no doubt that for the purpose of keeping sheep alive, which is the object of the system of feeding now under discussion, a still smaller quantity of total nutrient matter will suffice. Wolff's figures are however those usually accepted as authoritative and will serve as a guide in discussing the merits of different mixtures.

The following table gives the average composition of the different fodders and feeding stuffs used in the rations we are about to discuss. The five centre columns within double lines give the ingredients which have to be compared with the standard ration.

COMPOSITION of Fodders used in the Rations.

Fodder	Water	Ash.	Fibre	Total dry matter.	Albumenoids.	Carbohydrates	Fat	Total nutrient matter	Nutrient ratio.
Wheat (grain) .	10·5	1·8	1·8	89·5	11·9	71·9	2·1	85·9	1 6¼
Oats (grain)	11·0	3·0	9·5	89·0	11·8	59·7	5·0	76·5	1 6
Maize (grain)	10·9	1·5	2·1	89·1	10·5	69·6	5·4	85·5	1 7¾
Lucerne hay	8·4	7·4	25·0	91·6	14·3	42·7	2·2	59·2	1 3¼
Wheaten hay .	8·8	4·5	35·9	91·2	3·6	46·1	1·1	50·8	1 13
Oaten hay .	10·0	5·0	25·3	90·0	4·5	43·7	1·5	49·7	1 10½
Wheaten straw	9·6	4·2	38·1	90·4	3·4	43·4	1·3	48·1	1 13½
Oaten straw ...	9·2	5·1	37·0	90·8	4·0	42·4	2·3	48·7	1 12
Bran .	11·9	5·8	9·0	88·1	15·4	53·9	4·0	73·3	1 4
Pollard . .	10·0	3·8	5·2	90·0	17·4	58·0	5·6	81·0	1 5
Molasses	25·0	5·0		75·0		70·0		70·0	. ..
Cocoa-nut cake ..	7·3	5·4	9·7	92·7	17·2	41·3	19·1	77·6	1 5
Mangels	90·9	1·1	0·9	9·1	1·4	5·5	0·2	7·1	1 4¼

From the figures in this list there have been calculated in the next table the actual amounts of the different nutritive constituents contained in the rations used for feeding on a number of runs in the State.

The details as to these rations have been obtained from various trustworthy authorities, and embody information supplied to the Department directly, and also through some of the leading pastoral agencies. I have avoided in all cases the mention of individual names.

TABLE showing the composition of different rations in actual use.
Expressed in pounds per head per day.

	Total dry matter.	Albu-menoids.	Carbo-hydrate.	Fat or oil.	Total nutrient matter.	Albu-menoid ratio.
STANDARD RATION.	**1·6**	**0·18**	**0·87**	**0·045**	**1·095**	**1:5½**
1. 4 oz. maize	0 22	0·03	0·17	0 014	0·214	1 : 7¼
2. 6 oz. wheat	0·34	0·04	0·27	0·008	0·318	1 : 6½
3. 2 lb. oaten straw chaff	1·80	0·08	0·84	0·04	0·96	1 : 12
4. {2 lb. wheaten straw ½ lb. molasses}	2·18	0·07	1·22	0·03	1·32	1 . 19
5. 1 lb. lucerne hay	0·92	0·14	0·43	0·02	0·59	1 : 3½
6. {½ lb. lucerne hay ½ lb. wheat}	0·91	0·13	0·57	0.02	0·72	1 . 5
7. {1 lb. chaff ½ lb. oats} for lambing ewes	1·36	0·096	0 76	0·036	0 89	1 · 9¼
8. {½ lb. chaff ¼ lb oats} for weaners	0·67	0 047	0·36	0·02	0·43	1 : 9¼
9. ½ lb. oats, for wethers	0·45	0·06	0·30	0.025	0·38	1 · 6
10. {¾ lb. bran ¼ lb. chaff}	0·89	0·123	0.50	0·034	0·67	1 : 8¾
11. 2 lb. oats	1·80	0 24	1·20	0·10	·52	1 : 6
12. 1½ lb. wheaten chaff, for lambing ewes	1·37	0·06	0 69	0 01	0·76	1 12
13. {1¼ lb. mangels 1½ lb. wheaten chaff, sprinkled with diluted molasses} for valuable sheep	1·486	0·088	0·737	0·025	0·851	1 . 9

Rations 1 to 5 were communicated by stock-breeders to the Department and are in actual use, though there is no information supplied as to the success of these rations, or whether other food, such as scrub, is available. With regard to Nos. 1 and 2, they are both so much below the standard in all respects that it is not conceivable that they could be used successfully alone for any length of time. At least 1½ lb. maize or 2 lb. wheat are required to give the necessary amount of nourishment. Even with these quantities the monotony and unpalatability of a purely grain diet would render it less valuable than it appears on paper. A mixed ration, and, if possible, a variety in the ration, is always to be preferred.

With regard to No. 3, chaffed straw of all descriptions is deficient in albumenoids. The amount here given provides a sufficiency of everything except albumenoids, which should be supplied by the addition of some such food as bran or pollard or lucerne hay. The

same applies to No. 4, the mixture of straw and molasses. The addition of molasses is an unsuitable one in this case, as it provides no albumenoids, though the ration provides more than is required of carbohydrates and of total nutrient matter.

Lucerne hay by itself (No. 5) is too nitrogenous for feeding alone, 1 lb. providing nearly all the albumenoids required, but only half the necessary carbohydrates, fat, and total nutrient matter. It should be mixed with fodders richer in sugar and starch.

No. 6 was quoted by the Hon. B. R. Wise in a thoughtful statement recently made to the Melbourne *Age* on the subject of the fodder duties, and is stated by him to be used on one of the New South Wales stations. It is not specified whether lucerne or wheaten hay is used; if wheaten hay is meant the nutrient matter becomes still smaller, the albumenoids in particular dropping from 0·13 to 0·08.

It is clear that this is, as Mr. Wise says, obviously a starvation allowance, just sufficient to keep the sheep alive.

Nos. 7 to 10 are taken from the *Pastoralists' Review* of 16th June. No. 10 is there stated to be the best of the batch. It is much richer in albumenoids than the others. In the case of No. 9 this is supplemented by a little picking from the paddocks. The cost of this feeding is 8d. to 1s. per head per week. Another correspondent in the same publication records his experience of feeding the year before last, when he found that it took 2 lb. of oats per day per sheep to keep them going. He fed them on this for about two months, and, as will be seen (No. 11), it is a fairly good, though probably monotonous and unpalatable, feed, containing a larger proportion of nutritive matter than is required, and well balanced.

The following information from six stations on which artificial feeding has been resorted to was supplied me through the courtesy of one of the Land Companies interested in pastoral matters.

Station No. 1.—About 7,000 sheep are being fed upon sheoak, and have done well all the time. Rain has now fallen sufficient to bring herbage and grass.

Station No. 2.—Some dry sheep and ewes have been fed upon mulga for several months, and are doing fairly well. The ewes were not, however, able to rear their lambs, which have disappeared.

Station No. 3.—Some dry sheep and a number of lambing ewes are being fed upon wheaten chaff, at a cost of 7d. per head per week. The percentage of lambs reared is very small, but the sheep are apparently holding their own. Ration, 1½ lb. per day. There is dry grass left for grazing. (See No. 12 in table.)

Station No. 4 (which is over the border in Queensland).—Here the owner is feeding upon edible scrubs of all kinds, ironbark, beefwood, whitewood, &c., and the sheep were holding their own until the last week or two, when they commenced to fall off in condition considerably. Fair to middling to start with. Artificial feeding about six weeks.

Station No. 5.—The owner is feeding upon turnips, mangels, and good wheaten chaff; 1½ lb. of the former and 1½ lb. of the latter per day is the ration given. The chaff is sprinkled with diluted molasses. Sheep are very valuable in this case, and the feeding has brought out satisfactory results. (No. 13 in table).

Station No. 6.—1½ lb. of wheaten hay per day has been given, in addition to wilga scrub, to a number of lambing ewes. The lambs saved will probably be about 20 per cent. The experiment has proved moderately successful. (No. 12 in table.)

In the next table are given a few rations devised to meet the food-requirements of sheep, as expressed by the standard already quoted. These may be found useful for the purpose of preparing rations with any particular food that is readily available, or economical. They are devised on the assumption that there are no pickings. If pasture or scrub plants are to be had, the rations for hand-feeding may be proportionately reduced. It will also enable stock-owners to vary the feeding from time to time, and avoid the disadvantage of having to feed for a length of time on the same diet, a plan which is always undesirable, and especially so when grain is fed. A mixed grain ration is always preferable to single grain fed alone (see No. 3 and 4). These two rations are in the same proportions, but not in the same quantities, as have been found suitable in experiments conducted by the Texas Experiment Station.

TABLE of Rations devised to provide proportions required by Standard Expressed in pounds per head per day.

	Total dry matter	Albuminoids	Carbo-hydrates	Fat or oil	Total nutrient matter	Albuminoid ratio
STANDARD RATION.	**1·6**	**0·18**	**0·87**	**0·045**	**1·093**	**1 : 5[illegible]**
1. ¾ lb. wheaten straw chaff; 1 lb. lucerne hay	1·60	0·173	0·757	0·051	0·962	1 : 5
2. 1 lb. bran; ½ lb. molasses	1·26	0·15	0·89	0·04	1·08	1 : 6
3. ½ lb. maize; ¼ lb. oats; ¼ lb. bran	1·12	0·15	0·78	0·06	1·00	1 : 6¼
4. ½ lb. maize; ¼ lb. oats; ¼ lb. bran; 2 oz. cocoanut meal	1·24	0·17	0·85	0·08	1·07	1 : 6¼
5. 1 lb. wheaten straw chaff; ½ lb. bran	1·79	0·12	0·92	0·04	1·08	1 : 8
6. 1 lb. lucerne hay; ¾ lb. chaff; ¼ lb. molasses	1·56	0·16	0·83	0·03	1·01	1 : 5¾
7. ½ lb. lucerne hay; ¾ lb. wheaten chaff; ½ lb. cocoanut cake	[illegible]	0·17	0·65	0·11	0·92	1 : 5½
8. ¾ lb. wheat (grain); 1 lb. wheaten hay	1·60	0·13	1·00	0·02	1·15	1 : 8
9. 5 lb. mangels or turnips; ½ lb. wheaten chaff; ½ lb. bran	1·34	0·17	0·80	0·034	0·98	1 : 5¼
10. 5 lb. mangels; ½ lb. bran; ¼ lb. molasses ...	1·08	0·15	0·75	0·03	0·91	1 : 5¼

These rations are only offered tentatively as suggestions. It is unlikely that smaller quantities will be found capable of keeping animals alive in fair health in the absence of pickings. The question

of the minimum ration for this purpose has yet to be settled, and arrangements are being made whereby the matter can be thoroughly tested at the Bathurst Experiment Farm, where it is proposed to conduct a number of experiments on sheep with some of the above and other rations. The sheep fed on the different mixtures will be kept separate and under observation, and their condition and weight noted for longer periods. When this has been done we should be in the possession of information from which we shall be able to calculate with some degree of certainty the minimum amounts of food which will keep sheep alive without detriment to their health, and to devise rations to meet these requirements.

The present prices ruling in the Sydney market are given below. They may serve as a guide in the selection of the most economical foods, and will help in calculating the cost of the different rations.

Lucerne Hay	£8 10s. per ton.	1d per lb.
Bran	1/4 per bushel.	¾d. ,,
Pollard	1/4 ,,	¾d. ,,
Maize	4/8 ,,	1d. ,,
Wheat	4/6 ,,	¾d. ,,
Oats	3/6 ,,	1d. ,,
Chaff	£5 per ton.	½d ,,
Cocoanut Oil Cake	£9 ,,	1d. ,,
Turnips	£3 ,,	⅓d. ,,
Molasses	£3 ,,	⅓d. ,,

It will be seen that the ration chosen for the standard is that recommended for young growing sheep, weighing about 56 lb. This has been chosen for the following reasons:—The principal differences in the food required for young and for mature sheep are that the latter require a smaller amount of nutritive matter, and notably a smaller proportion of albumenoids than do growing sheep, but at the same time they need a larger bulk of food (total dry matter).

In a mixed mob it is not possible to study individual idiosyncrasies, and the same food must be given to young and old; but it is essential that the young sheep shall have the proper kind of food to enable them to grow—one, namely, that is fairly rich in albumenoids. The mature sheep are more likely to adapt themselves to the more nitrogenous food than the younger sheep would be to adapt themselves to a ration deficient in the material essential to their growth. Further, ordinary pasture-grass, which is the natural food of both young and mature sheep, approaches very nearly in composition the ration taken as the standard. In 8 or 9 lb. of pasture-grass the quantities of nutritive material are nearly the same, and in the same proportions as in the standard ration.

The cost of the rations tabulated above vary from 1d. to 1¾d. per sheep per day at the present market rates. It is, of course, easy to devise more perfect rations if this cost is exceeded, but it becomes doubtful whether the increased value of the animals would justify the expenditure.

The real question at issue is whether such small rations are economical. If after a few weeks' feeding on such borderland rations the sheep are in such an impoverished state that they succumb to the

first cold or wet spell, or are unable to regain condition, then even the comparatively small expenditure is money thrown away.

I have endeavoured to present the problems involved in such a way as to indicate what is the lowest amount of food on which sheep can be kept in good health with some degree of certainty. Any lowering of this ration must be regarded as an experiment, and it must be done with great caution and with full appreciation of the possible consequences. I believe that it will be found that the ration can be reduced with greater safety if a change of diet is provided, and that sheep could thrive on smaller quantities if they got plenty of variety in their food. Thus a grain diet, such as No. 3, might be given for a week or so, when it could be replaced by hay and chaff, as in No. 6, or by roots, as in No. 9. The expense would be no greater, and the gain in palatability very much increased.

Numberless ways of varying the food will occur to the practical feeder, such as giving grain alternately dry and soaked, mixing in stuff like molasses and oil-cake in small quantities with different kinds of food, and so on, and I am convinced that the extra trouble involved in this direction will be fully repaid.

In conclusion, there are added the results of analyses of some of the indigenous fodders, such as scrub plants and salt-bush, which will afford some information as to the nature of the pickings obtainable.

ANALYSES of the leaves of some of the common Scrub Plants.

	Water.	Ash.	Fibre.	Ether extract (oil, &c.)	Albumenoids.	Carbo-hydrates.	Nutrient value	Albumenoid ratio.	Tannin (oak-bark).
1. BOOLIGAL. (Eucalyptus largiflorens. F.v.M.)	16·07	4·13	9·65	7·24	6·75	56·76	80	1 : 11	5·6
2. APPLE TREE. (Eucalyptus Stuartiana. F.v.M.)	34·55	3·27	9·65	3·17	6·37	42·99	56½	1 : 8	6·3
3. STRINGY-BARK. (Eucalyptus macrorrhyncha. F.v.M.)	39·45	2·59	6·38	5·05	5·56	40·97	57½	1 : 9½	2·9
4. RIVER OAK. (Casuarina Cunninghamiana. Miq.)	42·27	2·96	20·90	1·66	6·81	25·40	36	1 : 4½	1·7
5. CATTLE GUM. (Eucalyptus coriacea. A. Cunn.)	36·76	2·90	8·57	6·02	8·75	37·00	59	1 : 5½	1·5
6. CURRAJONG. (Sterculia diversifolia. S. Don.)	35·61	4·99	14·54	1·70	10·35	32·81	46	1 : 3½	2·4
7. ROSEWOOD. Heterodendron oleaefolium. Desp.)	12·27	4·84	16·36	2·20	15·75	48·58	69	1 : 3½	3·7
8. BELAR. (Casuarina. Sp.)	11·70	5·66	46·86	2·80	9·06	23·92	30½	1 : 3½	2·5
9. DOGWOOD. (Myoporum. Sp.)	28·62	3·52	10·88	2·27	9·31	45·40	59½	1 : 5½	1·3
10. WARRIAH.	11·32	5·14	35·92	3·81	11·93	31·88	52½	1 : 3½	1·2
11. WILGA. (Geijera parviflora. Lindl.)	47·73	5·21	7·61	2·18	14·25	23·02	42	1 : 2	2·4

ANALYSES of the leaves of some of the common Scrub Plants—*continued.*

	Water.	Ash.	Fibre.	Ether extract (oil, &c.)	Albumenoids.	Carbo-hydrates.	Nutrient value.	Albumenoid ratio.	Tannin (oak-bark).
12. WHITEWOOD. (Atalaya hemiglauca. F.v.M.)	35·87	6·27	19·50	1·19	14·62	22·55	30¾	1 : 2	1·3
13. CURRAWONG. (Acacia Sp.)	13·45	2·93	30·61	1·96	12·87	38·18	57½	1 : 3½	1·0
14. BUNBUTT.	23·55	7·71	16·65	4·03	13·50	34·56	56	1 : 3¼	3·0
15. BELAR. (Casuarina Sp.)	19·44	4·01	27·15	3·40	9·75	36·25	53½	1 : 4½	2·4
16. NEEDLE-BUSH. (Hakea leucoptera. R.Br.)	12·59	4·79	39·09	0·74	6·44	36·35	41½	1 : 6	1·5
17. WILGA (second sample). (Geijera parviflora. Lindl.)	50·84	5·18	8·01	2·55	12·15	20·97	39	1 : 2	2·2
18. BEEFWOOD. (Grevillea striata. R.Br.)	37·11	2·85	26·58	0·90	5·62	26·94	34½	1 : 5	1·5
19. MULGA. (Acacia aneura. F.v.M.)	59·06	3·60	29·90	2·55	9·06	15·83	30¼	1 : 2½	1·8
20. EMU-BUSH. (Eremophila longifolia. F.v.M.)	51·59	3·70	5·43	0·75	8·87	29·66	40¼	1 : 3½	2·6
21. WHITEWOOD. (Atalaya hemiglauca. F.v.M.)	37·55	6·46	22·05	1·73	11·63	20·58	36	1 : 2	1·2
22. ROSEWOOD. (Heterodendron oleaefolium. Desp.)	34·27	2·29	13·74	4·28	10·31	35·11	55	1 : 4¼	4·3
23. SUPPLE-JACK.	33·16	6·61	14·96	1·21	11·03	33·03	46¾	1 : 3¼	2·4
24. LEOPARD-WOOD. Flindersia maculosa. F.v.M.)	41·70	3·42	11·43	3·92	9·31	30·22	48¼	1 : 4¼	2·9
25. GIDGEA. (Acacia ? homolophylla. Cunn.)	41·03	8·73	22·59	2·08	7·31	18·26	29¼	1 : 3	2·0
26. SANDALWOOD. (Eremophila. Sp.)	41·84	5·62	8·82	1·73	8·62	34·87	47	1 : 4½	2·3
27. QUININE. (Alstonia constricta. F.v.M.)	51·72	3·65	9·22	1·89	9·00	24·52	37¾	1 : 3¼	1·7
28. BROOM BUSH. (Apophyllum anomalum. R.Br.)	19·70	13·22	44·76	1·57	9·94	10·72	24¼	1 : 1½	1·7
29. CURRANT-BUSH. (? Leptomeria aphylla. R.Br.)	18·03	4·96	33·12	4·50	5·62	33·77	49½	1 : 7¾	1·5
30. WILD FUCHSIA. (Myoporum acuminatum. R.Br.)	33·32	3·88	5·13	1·49	9·06	47·10	59½	1 : 5½	3·0
31. COLANE. (Owenia acidula. F.v.M.)	49·01	6·86	12·47	1·12	9·19	21·35	33	1 : 2½	1·5
32. BLUE or APPLE BUSH. (Heterodendron oleaefolium. Desp.)	24·61	4·85	19·53	1·94	12·18	26·89	43½	1 : 2½	3·3
33. MYALL. (Acacia pendula. Cunn.)	48·45	4·45	19·64	1·21	9·62	16·63	29	1 : 2	0·5
34. BRUMBLE or WILD ORANGE. (Capparis Mitchelli. Lindl.)	28·00	8·06	18·97	1·26	13·12	30·59	46½	1 : 2½	2·3

The value of prickly-pear as a fodder, after treatment to remove or soften the spines, is becoming generally recognised, and it may not be out of place to insert the results of analyses of different varieties of this plant, which have been made in the Laboratory of the Department.

ANALYSIS of Prickly-pear.

	Water.	Ash.	Fibre	Oil.	Albumenoids.	Carbo-hydrates.	Nutrient value.	Albumenoid ratio.
1. Opuntia Ficus Indica	93·76	1·22	0·55	0·35	0·50	3·62	5	1 to 9
2. Opuntia Elatior ..	89·76	1.92	1·39	0 35	0·65	5·93	7½	1 to 9
3. Opuntia Brasiliensis .	86·19	2·43	1 51	0·46	0 90	8 51	10½	1 to 10
4. Optunia Coccinellifera	87·89	1·73	0·96	0 34	0·78	8·30	10	1 to 12

A couple of analyses of Salt-bush (*Atriplex nummularia*) are also given, in order to show the feeding-value of these valuable fodder plants.

ANALYSIS of Salt-bush.

	A. nummularia. Grown at Wagga. (Under cultivation.)	*A. nummularia.* From Bourke. (Uncultivated.)
Moisture	75·11	56·73
Oil	·66	·67
Digestible fibre	8·21	11·59
Woody fibre	3·29	3·93
Soluble albumenoids	·50	1·76
Insoluble albumenoids	2·56	3·54
Soluble ash	5·77	14 14
Insoluble ash	·15	2·04
Chlorophyll, amides, and other extractives (by difference)	3·85	5·60
	100·	100·
Total nitrogen	·74	1 29
Amide nitrogen	·25	·36
Percentage of common salt in ash	36 6	56 6

The great difference in the percentage of moisture is due to the fact that the Wagga specimens had not so far to travel, and were more carefully packed.

INSECT AND FUNGUS DISEASES OF FRUIT-TREES.

A NEW edition of the Handbook on Insect and Fungus Diseases of Fruit-trees and their Treatment is now ready. Copies may be obtained at the Government Printing Office, Sydney, price, 1s.

HAWKESBURY AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM.

THE MANURE SPREADER.

H. W. POTTS.

OWING to the rapid advance and great development in the designing and manufacture of labour-saving machinery and appliances on the farm, it is not surprising to note the attention directed to the manure spreader from time to time. Its advent may date from 1878, when a modified form of the existing waggon appeared at several of the shows in Great Britain. It did not "catch on" there, but eventually a number of farmers in the United States gave it a trial, and it evidently succeeded there sufficiently to warrant its extended use. As a result of practical test, a number of structural defects have been made apparent. Several farmers do not hesitate to speak highly of its use, not only as a labour-saver, but also in distributing manure more evenly. It can be adjusted to spread 15 loads to the acre as readily as 40, or 5. In top-dressing, it is a matter of considerable advantage to be able to regulate the distribution, as with other machines attention should be given to oiling and care. One farmer writing about a manure spreader states: "We bought one in 1881. It has been used every year since, and not one cent paid out for repairs. It is now running on a job of pretty near 300 loads. During part of the years that it has been in use I spread the manure, *i.e.*, I rode on the spreader. It seemed to me very much easier to sit still and let the horses do the work in two or three minutes than it was to work hard fifteen or twenty minutes to do it myself with a fork. I am safe in saying, after having spread thousands of loads, that we can get out twice as much per day with the spreader as the same man could spreading by hand. The manure is torn up and spread evenly, and it distributes just the quantity required." So far this, and other testimony in the journals as the subject crops up in a sporadic manner, points to the manure spreader as a desirable adjunct to the daily routine of modern farm life. It may, however, be interesting, and of more practical value, to quote the experience gained with one at the farm here. About nine years ago a manure spreader was purchased at a cost of £40. It was put into work to distribute about 700 tons of refuse from boiling-down digesters, and for this purpose it answered

very well, but it gradually became apparent that several faults existed in its design. From a haulage point of view, the drawback is the fore wheels do not "track" with the hind, and thus increase the power needed to draw it. Again, the fore carriage is secured to the axle by means of an extended king-bolt throwing the weight on to the centre, and in use this creates extension unevenly on the body of the waggon, and it has become twisted out of its original shape so much so that it throws the revolving machinery out of gear. The fore carriage ought to be connected with the waggon by means of a wheel-plate to avoid the straining and to lighten the draught. The revolving or movable floor of the waggon as it forces the manure to the rear of the waggon throws all the weight on to the back wheels. Further, the mechanism which regulates the speed of delivery or quantity of manure per acre, a screw and cog-wheel, was found to wear out quickly. This might be replaced advantageously by a sprocket-wheel and link belt.

It is found in practice that it answers well with all short, well-decayed manures. With fresh stable manure it requires extra attention to avoid long straw becoming entangled in the spokes of the revolving delivery barrel. When this is kept clear the manure is well torn up and spread more regularly than it is possible to do by hand.

As a result of experience we propose to have the College manure-spreader remodelled on the lines indicated, and fully anticipate that it will last in constant use as long as a binder or other similar farm machine. The cost of the waggon is high, seeing it cannot be used for any other purpose. The photographic illustrations clearly demonstrate the faults developed by actual use.

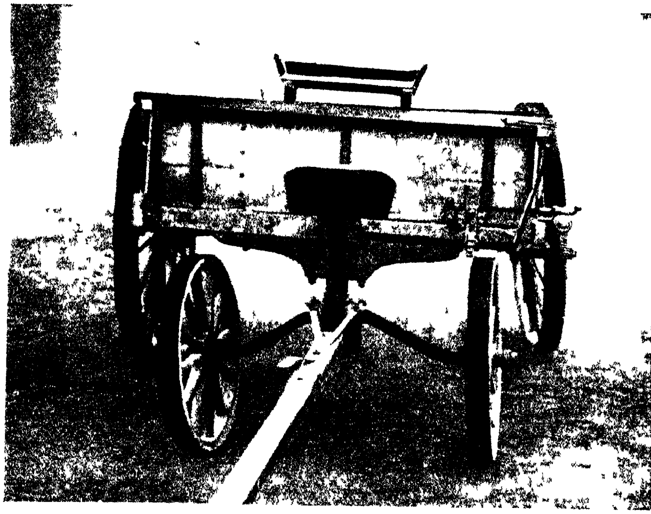
It may be mentioned that makers of these waggons have already noted several of these defects, and those recently placed on the market are better designed and more substantial. It may safely be predicted that the manure-spreader will prove a useful addition to the equipment of a farm.

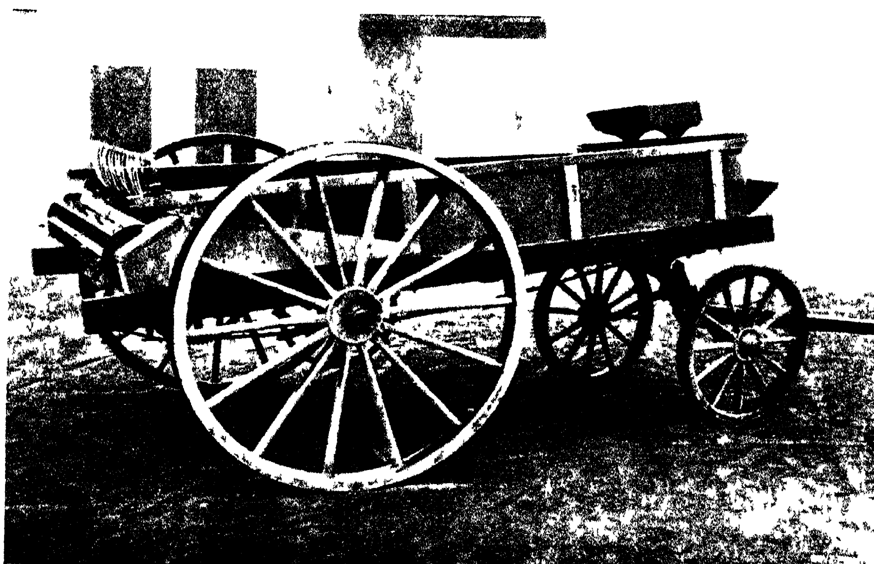
Cowpea (*Vigna-Catiang*), Fodder Plant and Soil Renovator.

GEO. L. SUTTON, Experimentalist.

There is a growing demand among agriculturists of all classes for some crop which may be profitably utilised for increasing the humus or organic matter in their soils. It is beginning to be generally recognised that the failure of crops in many districts is not due so much to the lack of plant-food in the soil as to the gradual burning-out or exhaustion of the organic matter which it contained in its original state, the sponge-like character of which increased the capacity of the soil for retaining moisture, and consequently enabled it to resist drought for a longer period.

Whilst all plants, weeds included, are useful for the purpose of adding organic matter to the soil, yet all are not equally valuable. Nutritious forage crops, where it is possible to grow them, are more valuable than weeds, and plants, which in addition to having a high





Manure Spreader at H. A. College showing defects referred to.

feeding value, have also the power of adding plant-food to the soil, are still more valuable and worthy of attention.

Of all the plants under cultivation, legumes have the greatest power of increasing the plant-food in the soil. They are able by means of bacteria which, under certain conditions, flourish on their roots, to assimilate the free nitrogen of the air, of which there is an inexhaustible supply, conserving it in their roots, stems, and leaves for those crops such as wheat, maize, sorghum, &c., that have not this power, but are compelled to draw upon the amount available in the soil for their supply.

In the very front rank of the most useful plants belonging to this order—*Leguminosæ*—must be placed the cowpea. It is both a soil renovator and a valuable forage plant, and has a special value in that it will produce a crop on land too poor to grow many of the legumes. It prefers a light soil, but cane grown in almost any class of land if well drained. For improving light sandy soils it is unexcelled by any plant, for in such soils it can be relied upon to make luxuriant growth if fertilised, when necessary, with phosphoric acid and potash.

Cowpeas in common with other legumes, are able to utilise the free nitrogen of the air by means of micro-organisms which flourish on their roots, forming little lumps or nodules, which are illustrated in A, Fig. 1. Lumps or swellings, which resemble these bacterial nodules, are often caused by nematodes or eel-worms; these are represented in B, Fig. 1.

Unless the bacteria, which convert the free nitrogen of the air into soluble nitrates and make it available for the plant's use, are present in sufficient quantities, cowpeas are quite as unable to utilise the atmospheric nitrogen as are the non-leguminous plants—wheat, maize, etc.—and consequently are then just as dependent upon the soil for their supply of this element. This will explain why in some soils cowpeas do not flourish well when planted for the first time; but the soil having once become inoculated with the necessary bacteria, they rapidly increase, provided the right conditions be present, and hence better results are obtained the second and succeeding times that the cowpeas are sown.

In addition to utilising and conserving the atmospheric nitrogen, cowpeas are deep-rooted plants and draw upon the stored-up resources in the subsoil for a large supply of their mineral constituents, phosphoric acid and potash, which become available for the shallower-rooted cereals. Thus cowpeas enrich the surface soil, by collecting nitrogen from the air and by rendering available some of the phosphoric acid and potash contained in the subsoil.

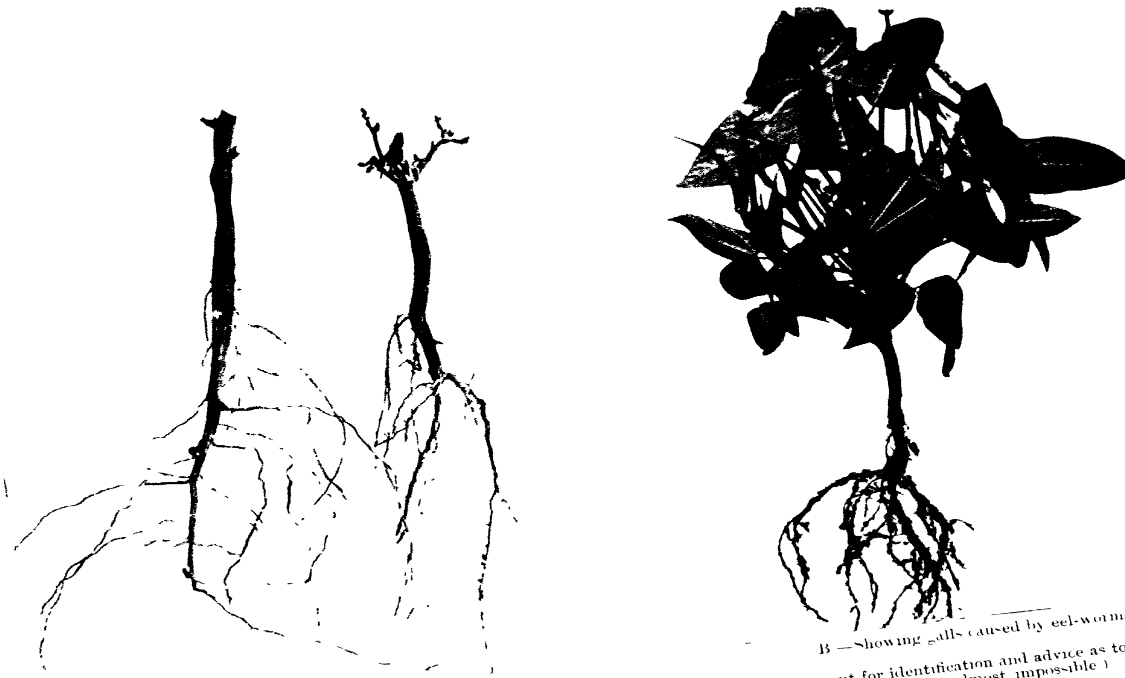
They are heavy feeders on phosphoric acid and potash, and if the vines are removed from the ground and the manure not returned, they will be found a somewhat exhausting crop; for though the roots and stubble will contain sufficient nitrogen for a succeeding crop, yet the phosphoric acid and potash removed in the vines, unless returned in some way, is lost to the soil for ever.

It is the custom of many who grow this valuable plant to plough it under as a green manure, being unaware of the high feeding value

which it possesses. In the majority of cases this plan is a huge mistake, for the feeding value of the plant is very far in excess of its manurial value, and if the crop be fed off on the ground where it is grown, at least 50 to 75 per cent. of the manurial value will be returned to the soil, and at the same time the full feeding value will have been obtained. The practice of turning under such a mass of vegetation as the cowpea usually makes is of questionable benefit in a climate like ours, as the fermentation of this mass is so rapid that it causes acidity in the soil, which will have an injurious effect upon the succeeding crop; and in the case of our wheat-lands, the vegetation ploughed in will render the ground too loose for the best results to be obtained with the wheat-plant, and the soil so open that the moisture will readily evaporate.

According to various analyses published, cowpea vines have a very similar feeding value to green lucerne. They contain a little more water, but have not the disadvantage of affecting the flavour of dairy products. The vines are more difficult to turn into hay than lucerne, but cowpea whole-vine hay has a higher feeding value than lucerne hay. The vines, either in a green state or as hay, are a very suitable feed for young and growing animals, on account of the large amount of bone, flesh, and muscle-making material which they contain. When used in combination with maize or other carbonaceous crops, the combination forms a very suitable and economical ration for milking cows. From feeding experiments conducted at the Delaware Experiment Station, U.S.A., it was found that cowpea hay was a perfect substitute for bran. The report says:—"Bran is at present sold at a price very much in excess of its feeding value. A trial to demonstrate that silage from cowpea vine is a substitute for bran was finished during last spring. This test involved the collection of careful daily records from six cows during a period of three months. Its result, in brief, was that 1 lb. of bran and 6 lb. of cowpea vine silage, when considered chemically, were interchangeable; when considered on the basis of the yield in butter and of milk, the balance was in favour of the cowpea vine. As the yield of vine on a measured acre slightly exceeded 12 tons of green plant, it follows that in this crop the herdsman, at moderate expense, can raise an equivalent of 2 tons of bran per acre." The result of trials like these, and the experience of stock-feeders who have used this plant as a fodder, place the feeding value of cowpea beyond dispute.

The cowpea is really a bean, and not a pea, as its name would seem to indicate. I have known farmers who have fallen into this error, and have sown this plant in the winter, and, of course, have met with failure, as it was killed by frost, and it is essentially a hot-weather plant, and, provided moisture be present, the hotter the weather the better the plant will grow. It seems to revel in heat, and even when moisture seems deficient it is marvellous to note how this plant flourishes during the very hottest weather, retaining its succulence and colour. No advantage is gained by planting this crop too early, *i.e.*, before the ground becomes warm, for the seed is very susceptible to cold and damp, and will rot unless the conditions in the soil are



A.—Showing bacterial nodules on roots.

B.—Showing galls caused by eel-worms.

(When galls such as indicated in B are noticed on roots, specimens should be submitted to the Department for identification and advice as to treatment. Where soil is allowed to become thoroughly infested with eel-worm, the production of healthy crops is almost impossible.)

Roots of Cowpeas.

favourable for germination. I find for the early crop that the end of October is quite as early as it is safe to plant it in this district.

Our practice is to plant the cowpeas in drills about 3 feet apart, and the grain 6 or 8 inches apart in the drills, using from 8 to 10 lb. of seed per acre A maize drill fitted with a plate having ⅜ in. holes is a very suitable implement to plant them in this manner. After they are above ground the scuffler is run through the drills about once a fortnight, or as often as necessary to break the crust caused by a shower, until the vines begin to meet, when cultivation ceases.

In some parts of America it is the practice to sow this crop broadcast and on good soils, and where moisture is not likely to be lacking, good results would, I believe, be obtained by this method, using about a bushel of seed per acre. Crops raised in this way could, I think, be made more easily into hay as the stems would not be as thick and strong and would dry more readily.

The quantity and quality of fertiliser used to grow this crop will, of course, depend greatly upon the needs of the soil, which can only be found by actual experiment. Mr. Guthrie, Chemist to Department, in the *Farmers' and Fruit-growers' Guide*, supplies the following advice with regard to manuring cowpea and other leguminous crops :—

FERTILISERS FOR CLOVERS AND LEGUMINOUS CROPS.

"The power possessed by this class of crop of obtaining their nitrogen from the air renders the application of nitrogenous fertilisers of less importance than in the case of the other crops. The growth of the root-nodules peculiar to leguminous plants depends upon the amount of mineral fertilising ingredients available, and the manuring necessary for this class of crop is one that supplies abundance of lime, potash, and phosphoric acid.

"Liming at the rate of ½ ton to 1 ton to the acre is an essential to obtaining a successful crop, unless the land is rich in lime.

For Leguminous Crops and Clovers.

	Quantity per ½ ton.
Bonedust	150 lb.
Superphosphate	600 lb.
Sulphate of potash	400 lb.
	10 cwt.

The above mixture contains—

Nitrogen	=	½	per cent.
Phosphoric acid	=	12	,,
Potash	=	20	,,

Applied at the rate of 3 cwt. per acre this will give the crop—

1½ lb. Nitrogen	per acre,
36 lb. Phosphoric acid	
60 lb. Potash	

at a cost of 25s. 6d. per acre.

The above dressing on land previously limed should give a full crop. Liming alone will be found of very considerable benefit.

"The above fertiliser is for fairly good land, well supplied with vegetable matter. In soils poor in humus a somewhat larger dressing

of nitrogen is necessary, in order to give the young crop a start, and supply it with the nitrogen necessary for its growth before it is able to obtain it from the air.

For such soils the following formula will be found good :—

For Leguminous Crops on soils deficient in vegetable matter.

	Quantity per ½ ton.
Dried blood	150 lb.
Superphosphate	600 lb.
Sulphate of potash	400 lb.
	10 cwt.

This mixture contains :—

Nitrogen	=	2 per cent.
Phosphoric acid	=	10 ,,
Potash	=	20 ,,

and, applied at the rate of 3 cwt. per acre, will provide the crop with—

6 lb. Nitrogen
30 lb. Phosphoric acid } per acre,
60 lb. Potash

at a cost of 27s. per acre.

"The cost per acre for manuring leguminous crops according to the above formulæ is somewhat greater than for manuring wheat and fruit trees. It is to be remembered, however, that such crops actually enrich the soil in nitrogen, and act as a nitrogenous manure, even when they are cropped; so that if clover or cowpea is grown alternately with wheat the quantities of nitrogenous material required for manuring the wheat may be considerably reduced.

"If such a green crop be ploughed under, it is equivalent to a dressing of sulphate of ammonia of 5 cwt. to the acre, which would cost about £2 5s., or of 9 cwt. of dried blood (costing £2 14s.) This is, of course, in addition to the phosphoric acid and potash which is returned to the soil when the crop is turned under."

The vines have their highest feeding value when the first pods are beginning to ripen. When required for hay-making or soiling purposes the crop may be cut with a mower, but some little difficulty ensues, caused by the tangled mass which occurs when well grown, and which checks the swath-board from running freely.

I know of no other way of harvesting the grain but by hand-picking, for the pods ripen unevenly, and no machine has yet been devised and placed upon the market capable of thrashing these peas from the vines without breaking a very large percentage of them. The labour of hand-picking adds materially to the cost of the seed. These, according to the season, range from 7s. 6d. to 15s. per bushel of 60 lb., but as only a few pounds of seed are required to plant an acre, it is one of the cheapest crops to plant.

The varieties of cowpeas are very similar to each other, and are all capable of doing the same valuable work. They are distinguished by their habits of growth, bushy or trailing, by the colour of their seeds, black, clay, speckled, &c., and by the period of their growth, short season or early, whole season or late.

The best known varieties in this State are White, Clay-coloured, Whip-poor-will, and Black.

Fig. 1. Black

Fig. 2. Two drills to extreme left of spade, Warren's New Hybrid. Two drills nearest and to left of spade, Warren's Extra Early. Drills to right of spade, White.

White or Black-eyed Cowpea.—The colour of the seed of this variety is white, with a black patch upon the concave edge of the grain. It is one of the earliest, if not the earliest, grown here, and ripens its seed in about three months after planting. Successive sowings of this variety may be made from end of October right up to the middle of January. From the early sowing, two, and even three, cuttings of greenstuff can be made, and from the late sowing a crop of peas can be harvested before frost sets in. The cowpeas to the right of the spade in Fig. 2 are a late sowing of this variety at the Hawkesbury Agricultural College Experimental Farm. They were planted on 22nd January, 1902, and the photograph was taken on 19th May, 1902. It will be noticed that they have podded well, thus showing the earliness of this variety. During the period of their growth 208 points of rain fell, and was spread over 19 days, the highest recorded fall being 37 points. The rainfall for the previous two months was 193 points. The soil is a light sand.

This variety is the one likely to prove most valuable for green manuring in orchards, as, owing to its quick-growing habit, it can be planted after the early fruit is harvested, and thus can be grown when the soil moisture is not necessary for the development of the fruit. In the early stages of growth this variety is bushy and upright in its habit; later on, however, it usually develops runners. These become tangled together, rendering the harvesting somewhat difficult.

Clay, Whip-poor-Will, and Black are very similar to the White in their habit of growth. They reach maturity later, and in the order named. They are also distinguished from each other by the colour of their seeds, those of the Clay being dark clay-coloured, the Whip-poor-Will brown, speckled with chocolate; and the Black are, as the name indicates, black.

White's Perennial or Wonderful is a variety not as well known as the others in this State, but is better known in Queensland, whence we received it from Mr. Benson of the Agricultural Department, Brisbane. It is a very late variety, and differs from the others in that it is not as compact in its growth, but is trailing in its habit, developing runners 12 to 15 feet long, also its foliage is a paler green. Where the season is long enough this variety makes a very heavy growth. When grown here for the first time it produced 11 tons 13 cwt. per acre. Fig. 4 is a photograph of this variety grown during the present drought. Fig. 1 represents an adjoining acre plot of the black variety, growing at the same time, and illustrates the compact erect growth of the black variety as compared with the straggling and trailing habit of the Wonderful.

When intended for ensilage or soiling purposes cowpeas are sometimes planted at the same time and in the same drill with maize; this plan renders the harvesting of the cowpea somewhat easier than when grown alone, as the trailing cowpea clings to, and is supported by, the upright growing maize. I regard the Wonderful variety as especially suitable for this purpose.

In addition to these well-known varieties we have this season been trying at the College three new cowpeas, which, amongst other

legumes, were imported from the United States of America and India by Mr. Farrer with the object of obtaining a variety suitable for the dry wheat-growing districts in this State. One of the necessary qualifications of a plant suitable for this purpose is extreme earliness, for in some cases it will be necessary for the plant to depend upon the moisture left in soil by the winter rains for its development, and in other cases it may be desirable to plant a variety after the wheat has been harvested. For this purpose Warren's New Hybrid and Warren's Extra Early, two varieties reputed to be the earliest in existence, were brought from America. They were sown on 30th October, 1901, and were compared with our earliest variety, the White. In order to compare their productiveness a cutting of each was made on 10th January, 1902, ten weeks after planting. The results were as follows:—

White produced 9 tons 8 cwt. per acre.
Warren's Extra Early produced 8 tons 9 cwt. per acre.
Warren's New Hybrid produced 8 tons 1 cwt. per acre.

This result speaks well of them as drought-resisters, for during this time only three inchs of rain fell, the greatest fall in one day being 53 points. The rainfall for the previous two months was 283 points. The soil was light sand. So far these varieties have not proved as early as our White variety for the White ripened its pods six days earlier than the New Hybrid and fifteen days earlier than the Extra Early. This result may, to some extent, have been influenced by the change of climate, and therefore much value cannot be placed upon this single comparison for earliness.

The other new cowpea is a late variety, and is unnamed. It was obtained from Mr. Morland, Director of Agriculture, India, and is a very valuable introduction, on account of its upright and dense growth, which renders it quite distinct from the other varieties. This prominent feature is quite pronounced, and will simplify the harvesting by the usual farm machinery. So valuable did I consider this variety that I made no cutting to estimate the yield as I desired to save all the seed possible for next season's planting. It is a large yielder and vigorous grower, as can be readily seen from the accompanying photograph, Fig. 3.

The cowpea possesses in a wonderful degree the ability to adapt itself to changes in climate, especially if these be gradually made. There are very few parts of this State for which some suitable variety of this legume cannot be found, and whilst the cowpea is specially adapted for cultivation in the warmer districts, yet it is worthy of trial in the colder ones, for although clover may be, and is, doing a valuable work for the farmer in these latter districts, still if some variety of cowpea can be acclimatised and made to flourish in them, it will perform the same valuable work in a shorter period.

There is ample encouragement to carry out trials in this direction, for during the month of May of the present year it was quite apparent that the Black was resisting the cold and frost better than the Wonderful.

Fig. 3. The Upright-growing Cowpea from seed received from India.

Fig. 4. Wonderful.

Cowpeas at H. A. College.

THE DROUGHT AT HAWKESBURY COLLEGE.

C. T. MUSSON, Meteorological Observer.

THE College Farm is experiencing its first drought—one, probably, as severe as the district has ever seen. The dry period through which we are passing is similar to others that have occurred in the past, and such as we may experience in the future.

College Rainfall Records.

Our meteorological observations* reveal some interesting facts. Though only dating back to 1893 they are worthy of being placed on record. Extracts therefrom are given in two tables below with sufficient detail to show where the shortage of rain actually occurred.

Table I shows : (1) The annual rainfall since 1889 with averages over certain periods ; indicating a general shortage since 1895. (2) The actual rainfall, in points, during the three chief periods requiring it, summer, autumn, and spring; the exceptional shortage during last two years is here very apparent. (3) The heavy rains which penetrate the subsoil and give us a standby ; 1 inch of rain penetrates 1 foot in our sandy soil when in a dry condition. It is convenient to class all falls of 2 inches and over as "subsoil" rains. The table shows we have had very few of these since 1898. Those of the winter months are of little use for plant growth, especially so the July rains. (4) The mean yearly temperature, which has appreciably increased during the last six years over the preceding three. (5) The number of days with temperature over 90 ; in dry years there are more of these than in wet years.

Table II shows the number of falls of rain classified into quantities as stated. This table shows the number of light surface rains in each month as compared with the heavier, more useful, and subsoil rains.

To summarise these statistics briefly:—Our mean annual rainfall over last twenty-one years is 32·139 inches. During five good years, 1889-93, it was 44·185 ; for eight years, 1894 to end of 1891, it only averaged 29·74 ; whilst 1901 was the driest in the twenty-one year period. It will be seen, therefore, that the inception of this college took place midway (1891) in a series of good seasons, followed by drought conditions which, commencing in 1896, have continued to the present time, culminating in the present very serious condition of things. An element of uncertainty in the rainfall that must be noted is its frequent untimeliness, for instance, during 1900 we had in July 9½ inches out of the yearly fall of 35 inches. July rain is of little use to us for plant growth, for this is our coldest month ; certainly it fills tanks and is otherwise useful. Moreover, there has of late years been a remarkable dearth of thunder rain. It must be borne in mind that seasonal variations will retard or hasten our seeding operations both in spring and autumn, therefore these periods are somewhat elastic, here as elsewhere.

* Full details are published in the Annual Report.

On looking over the rainfall tables, it is seen at once that we have had a fair average each year of light surface rains, up to half an inch, and even up to one inch. Of the heavier falls, in 1899 falls of one to two inches occurred mainly in August, otherwise there has been a shortage in these since 1894; and since July, 1900, we have had none. Of the subsoil rains, two inches and over, we have had but four in four years, two of these in a winter month (July, 1900). In this shortage, therefore, during recent years of the heavy subsoil rains, and of the one to two inch rains during timely seasons lies the cause of our present very dry conditions. This amounts to the same thing as saying that "good years mean an extra quantity of the soaking rains"; for we may take it that an average rainfall is not sufficient to make a good season in any one locality.

Correlated with shortage of rain, the number of hot days has increased, and the annual mean temperature has risen slightly. There is usual a greater sum of heat in dry years than wet; moreover, under dry conditions evaporation from soil and water is increased, dependent largely, however, upon wind. The soil temperature is also considerably higher under dry conditions than otherwise. We have soil of two kinds in our orchard: (1) a white sandy soil that retains its moisture wonderfully and supports plants well in dry times, and (2) a chocolate sandy loam which dries up quickly, and under dry conditions is not so favourable to plants. In February, 1899, temperature tests were taken. The white sand in open cultivated ground stood at 130° Fahr. at a depth of ½-inch, whilst the chocolate soil was 137°, shade temperature at time being 89°.* We have but scanty information as yet with respect to Soil Physics under Australian conditions.

The lessons to be learnt from the drought here may be summed up in a sentence: Prepare for similar occurrences in the future. With us many very interesting facts are in evidence, helping us to understand details in respect of being better prepared in the future.

1. Cultivation minimises the effects of drought.
2. Certain varieties and kinds of plants have the property of resisting dry conditions to a certain degree.
3. Even in very dry times like the present good feed, though dry, is to be found in ungrazed areas, provided fire can be kept out.
4. The native grasses resist dry conditions better than most introduced forms.
5. There is a tendency under extreme conditions to encourage vegetative growth at the expense of seeding.
6. Soils vary in their relation to drought resistance.

These and other things we see around us as drought effects are valuable aids in teaching. The facts stated are doubtless well known, but they help us largely in the matter of turning attention in a most important direction—that of fighting successfully against dry conditions, an absolute essential in this land of recurring droughts.

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* Paper on Soil Temperature at H.A.C., *Ag. Gaz.*, 1901, p. 669.

TABLE 1

Years	Annual Rainfall at H A C	Average Annual Rainfall	RAINFALL IN POINTS: Summer Rains		Autumn Rains for Winter Growth		Spring Rains for Maize and other Summer Crops			Subsoil Rains	Mean Temperature	Maximum Temperature	
			Jan	Feb	April	May	Sept	Oct	Nov	Points Rain Registered at 9 a m Days recorded	Per Year	Number of days on which temperature reached 90 99	Number of days on which temperature reached 100 and over
	Inches												
1889	41.48												
1890	49.80	Over 5 years 44.185											
1891	38.03												
1892	50.24†												
1893	41.36		785	319	505	100	84	250	431	Jan [illegible] 493; Mar 9 208	61.87	9	1
1894	35.89		251	425	236	23	284	138	96	Feb [illegible] 232; Mar 7 576	61.91	29	2
1895	31.70		1,042	611	105	122	485	53	263	Jan [illegible] 378; Feb 8 473; Sept 2[illegible] 274	61.41	32	3
1896	24.71		279	344	23	87	121	174	321	June 250	62.32	23	15
1897	26.27	Over 8 years 29.74	109	52	270	187	72	156	34	June 1 400; Nov [illegible] 210	62.71	24	12
1898	30.86		404	554	44	526	203	348	41	Feb 1 231; Feb 14 500; May [illegible] 429	62.37	25	6
1899	32.77		120	42	278	189	240	219	369		62.80	35	11
1900	35.12		204	42	194	596	113	35	393	May [illegible]1 203; May [illegible]3 270; July [illegible] 2[illegible]4; July [illegible] 213	62.51	30	10
1901	20.64‡		209	155	235	75	74	109	125		62.25	37	9
1902*		Over last 21 years 32.139	200	27	64	48							

* Months † Highest in 21 Years ‡ Lowest in 21 years

TABLE 2.

FALLS OF RAIN IN EACH MONTH IN POINTS.

	January					February					March					April				
	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points
1893	1	1	1	1	1	3	3		1		3	1	2	2	1	[illegible]	[illegible]		2	
1894	3	2	3	1		3	2	1	1	1	4	2	2	5	1	2	1		1	
1895	3	4	3	2	1	1	3			1		1	1				1	1		
1896	1	3		1		4	3	2			2	3		1		1				
1897		1	1				2							1			1	1	1	
1898	2		2	2		1				2	5	1				1	1			
1899	1		1			1	1				2	3	3	1						
1900				1		2					3	1	1		1	2	4			
1901		2	2			2	4				1		3	1			[illegible]			
1902	3		1	1		1						3					1			

	May					June.					July					August				
	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points
1893	1	1	1			2	5	1	1		2	1	2			[illegible]	1			
1894						3	1	1			1	1					2			
1895	1		1			1					1						[illegible]			
1896	1	1				3	1	1	1	1										
1897	1		2			3	4			1		1	1	1		2	1			
1898	3	1			1	2	4	1	1			[illegible]				1	[illegible]		1	
1899	[illegible]	1	2			3	1	1	1		3	2		1		4	4	3	4	
1900	1	3			1	4	[illegible]	1	1		[illegible]	1	[illegible]	2	[illegible]	[illegible]	1			
1901		[illegible]				1	1				3		1			[illegible]	[illegible]			
1902		1				*														

	September					October					November					December				
	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points
1893			1			1		3			2	1	3	1		2	1		1	
1894	1	2		1		1	1	1			1	2				3	4			
1895			1	1	1	2							1	1		3	5			
1896		2	2			5	1				2	2	1	1		1	4			
1897	[illegible]					2	1	1			2				1	2	3		2	
1898	4	1		1					2		2					2	2			
1899		1	1	1		2	3	1			1	4	1	1		3	2			
1900	2	2					1				4	1	1	[illegible]		[illegible]	1			
1901	[illegible]	2	1			4	[illegible]				2	2					2			
1902																				

	Total Falls					Grand Total
	10–19 points	20–50 points	51–100 points	101–200 points	Over 200 points	
1893	24	18	14	9	2	67
1894	22	20	8	9	2	61
1895	12	16	8	4	3	43
1896	20	20	6	4	1	51
1897	15	14	6	5	2	42
1898	23	15	3	7	3	51
1899	22	22	13	9		66
1900	26	18	8	6	4	62
1901	20	25	10	1		56
1902						.

Summer rains (January–February).

Winter crops planted (April–May).

Rains specially useful for Winter feed.

Cold Month (July).

Winter rains of little use for plant growth, especially so the July rains.

Maize and other Summer crops planted (September–October).

Rains specially useful for starting Summer crops.

*June rain, 8 points to 13th

Note on Seeds of Cowpea.

C. T. MUSSON.

Seeing the high price obtaining for this seed, the question arises as to sowing requirements and possible saving of expense by limiting the quantity used, or adopting a variety which, by reason of giving a larger quantity of seed to the pound weight, would answer the same purpose. The results of a short preliminary examination of eight varieties may be here given.

The quantity usually advised for drills 3 feet apart is 7 to 10 lb. per acre: aiming at the resulting plants being about 9 inches to 1 foot apart in the drill. In one seed catalogue, 30 to 50 lb. is recommended to be sown broadcast for green manuring purposes. These figures refer to such varieties as Black, Clay-coloured, Wonderful, and Whip-poor-Will, and are taken as a basis. Three-foot drills would require for one acre 14,520 plants at 1 foot apart in the drill; this is approximately 6 lb. of seed: 7 lb. of seed would give about 9¾ inches between the plants, and 10 lb. would give about 6¾ inches. All the seed would not germinate; though usually cowpea seed is very fertile, giving under tests here 94 to 100 per cent.; there would be some loss from other various causes leaving blank spaces. On the whole 7 lb. of seed should be enough; even allowing for probable loss, it should result in the plants averaging something like 10 inches to 1 foot apart, which would be near enough. The following table shows number of seeds per pound, the result of three weighings averaged; whilst weight of seed required for varying distances apart above-mentioned, is stated per acre. The figures are all approximations; whilst in other seasons and in different districts there might be considerable variations from these numbers;—

No	Name	Colour, &c.	No. of Seeds to Pound	Drills 3 feet apart. Pounds of Seed. Plants 1 foot apart	Pounds of Seed Plants 9¾ inches apart	Pounds of Seed: Plants 6¾ inches apart.
1	Black ..	Black, white hilum	2,560	6	7	10
2	Warren's Ex. Early	Large, very light red	1,920	8	9½	13½
3	Wonderful	Dull brick red, elongate	3,200	5	5¾	8
4	Clay-coloured	Dull brick red	2,560	6	7	10
5	Whip-poor-Will .	Speckled, liver colour	2,880	5¼	6¼	8½
6	White ..	White, black eye, white hilum.	2,880	5¼	6¼	8½
7	Upright growing .	Small, pale brick red	9,440	1½	2	2¾
8	Warren's New Hybrid.	Angular, pale brick red	3,040	5	6	8¼

"Warren's Ex. Early" is therefore the heaviest seed—and the "Upright" growing variety, provided the seed were not more expensive, would be the most economical, if growth were satisfactory.

If prices ran all alike, the cheapest seed to use, except No. 7, would be "Wonderful."

Information as to the comparative yields of the different varieties is given in Mr. Sutton's article in this issue.

The illustrations show No. 7, "Upright" growing to be the more solid type of seed, though possibly this feature may be due to its being fresher than the other varieties, showing cavities between the seed-leaves. Plump seed may not necessarily be the heaviest, judging by the cross sections (see figs.).

In the course of this examination, it was noted that the colours of seed coats in varieties 2 and 8 varied very much—the original seeds obtained from U.S.A. were dark clay-coloured (figs. 9 and 10); as harvested, the bulk of our local product have very pale skins, change of climate, soil, and other conditions being, doubtless, the cause.

Hawkesbury District—August.

By H W. Potts

Probably in the record of no previous season has the necessity been so urgent as this for the display of activity on the farm, and in seizing every opportunity to get the land into proper condition for spring crops. Quickly growing crops should be promptly selected and every effort made, as a result of the poor winter and failure of rainfall, to meet the demands for feed. The forecast for next winter is one of general scarcity unless strenuous exertions are forthcoming and ample provision is made early this spring to meet the demand.

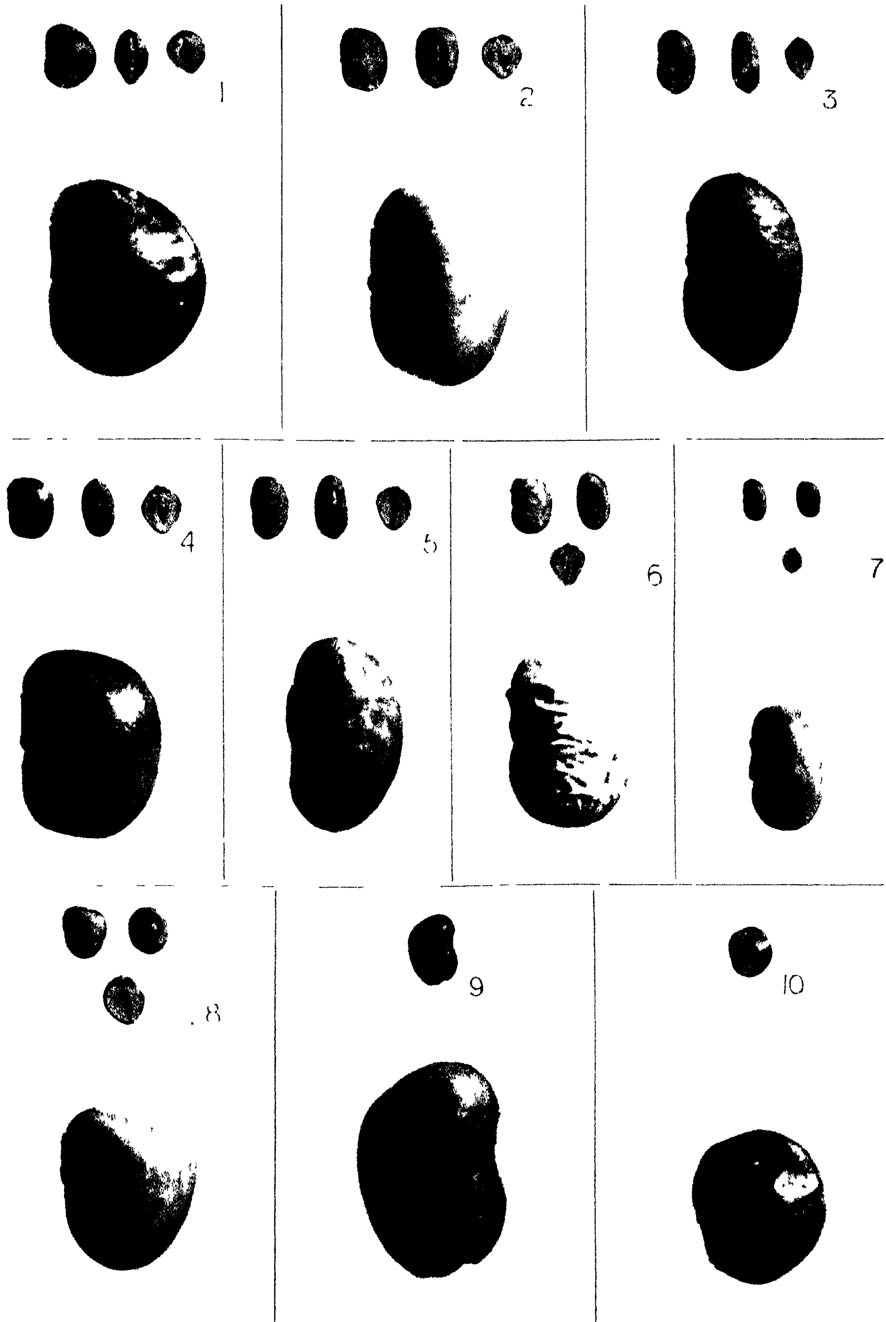
The value of lucerne as a hay was never so forcibly demonstrated as the present, and the lesson to those who have been sufficiently enterprising to store it has been fully rewarded, as well as distinctly pointing out the need for conserving it for next winter. To do this means the growth of adjunct crops. Time at this juncture is the "essence of the contract" when the need of every green crop is much in evidence.

Rye.—It is not too late in this district to sow rye, and it is looked on, wisely, as a most suitable fodder in the green stage. In fact, this cereal has not been sufficiently recognized, more especially in the dairying districts where an early green crop is of such practical value. It is hardy, resists frosts, is a vigorous and quick grower, and will give satisfactory returns in sandy and comparatively poor land.

Wheat.—The only wheat which may be sown now with any hopes of fair results is the Allora Spring variety. Where necessary the soluble fertilizers are the most suitable to use.

Millets.—As soon as the danger of severe frost is past this quickly growing fodder may be sown. Hungarian Millet is the best. It gives a fine yield if sown broadcast, but this is even better if drilled 18 inches or 2 feet apart. The advantage of drilling so far apart is found in the event of the continuance of the drought, when the crop can be cultivated, and the dry season effectively combated. 8 lb. of seed per acre will be required, but for broadcasting this must be increased to 10 lb. per acre. One feature should be remembered when the seed is drilled in—the plants are coarser in their growth, and hence are more difficult to harvest. The varieties known as White French Hungarian and Golden Wonder have proved the best for this district.

Mangolds.—Attention ought to be given to having mangolds sown as early as possible to evade the retarding influence of excessive heat



1 Black
2 Warren's Ex Early.
3 Wonderful
4 Clay-coloured
5 Whip-poor-Will
6 White
7 Upright (from India)
8. Warren's New Hybrid

In each case the three views profile, suture and section represent the exact natural size of the seed, the large illustration shows the seed magnified three times

9 Type of original seed of No 2 (Warren's Ex Early)
10 Type of original seed of No 8 (Warren's New Hybrid)

SEEDS OF EIGHT VARIETIES OF COWPEAS GROWN AT H. A. COLLEGE.

on the growth of the young plant. Long Red will be found most suitable for deep light soils, and Yellow Globe or Yellow Tankhard for the heavier soils; for rich loams, Mammoth Long Red. Many failures are recorded with the crop through preventing the seed germinating by sowing too deeply. The land should be subsoiled and ploughed to a depth of 12 to 15 inches, and brought to a fine tilth. Drill in the seed 20 to 30 inches apart, and thin out the plants at distances of 15 to 20 inches. When sugar beets are found more prolific the land may be treated in a similar manner, but the drills should be brought closer together with advantage, from 15 to 18 inches, and the plants thinned 10 to 12 inches apart. Mangolds require good root stimulation in the form of farmyard manure or superphosphate with kainit. The most serviceable manure for sugar beets is superphosphate and blood manure.

Potatoes.—It will be necessary this month to prepare for the main crop. The disputed gains from hilling or flat cultivation may justly be decided by prevalent local conditions and climatic characteristics. It is a simple matter for each grower to practically determine which is best by adopting both methods and noting the absolute returns, taking care to see that all conditions in seed and planting are equal. In response to the requirements of the Sydney market, it has to be observed that the dark coloured potatoes should be planted, and the white varieties rejected. Brownell's Beauty has in the past given the most satisfactory returns in the Hawkesbury district. If another sort be asked for, the best selection is Queen of the Valley. For domestic use at home Early Rose and Bliss' Triumph will prove early varieties and the heaviest yielders. Owing to the scarcity of seed potatoes this season, it may be of service to our growers to suggest the most economic methods of preparing them for planting. The function of the set is to provide a supply of food to the young plant until it develops its power to obtain nourishment from the soil, and care must be observed to provide an ample supply in the set. The first precaution to observe is to bring the soil into a rich condition by suitable manures. So far the direct applications of fertilisers have not been attended with immediate results. The plant does not respond with any degree of certainty. It seems to fail in assimilating the added plant-food. In all cases the enrichment of the soil seems more effective when provided by green manuring, or by the prior growth of leguminous crops. The rootlet of the potato will, under such conditions, attack the soil for nourishment more readily and easier. When the set is cut small only a light layer of soil should be used to cover it. The furrows to be run out at the usual depth. After dropping the set into the bottom, fill up just enough to cover the potato. Attention must be subsequently given to building up the furrow as the plant appears above ground.

Potato Scab.—The ever-present potato scab has to be dealt with each season. So far it shows no sign of disappearing, and it is a matter of necessity to apply some treatment where clean ground is to be planted. There are several methods of destroying this mould and its spores. The chemicals used mostly are bichloride of mercury, more commonly known as corrosive sublimate, sulphur, and formalin. The treatment

successfully pursued at the Hawkesbury is with a solution of corrosive sublimate, but it must ever be present in the minds of those employing this chemical that it is a powerful irritant poison, and great care must be exercised in handling it, and, further, in destroying any surplus solution, and in storing the chemical safely out of the reach of children. One pound of corrosive sublimate, costing about 3s., is sufficient to treat 1 ton of seed potatoes. It is sparingly soluble in water, and, to render it more so, it is a good plan to add equal parts of chloride of ammonia (sal-ammoniac). Take 2¼ ozs. each of corrosive sublimate and sal-ammoniac; dissolve in 2 gallons of cold water in an earthenware, glass, or wooden vessel, such as a demijohn; then add this solution to cask, and make up with water to 13 gallons; stir well. Place 1 cwt. of seed potatoes in a canvas bag, and immerse them in this solution for one and a half hours. They can be cut immediately after immersion, or allowed to drain and dry in a shady place, and subsequently stored until needed for use. In each case the bags in which the potatoes are stowed must also be thoroughly soaked in the solution. Having in view the poisonous character of the solution in treating the potatoes, on no consideration should they ever be used for feeding direct to stock. Naturally that is a remote contingency, but it is worth remembering. The more wholesome treatment by means of formalin or sulphur is now being advocated, and it is quite possible that equally useful results may be attained; and with this in view experiments will be conducted this season at the College.

Sweet Potatoes.—The roots from which it is proposed to raise plants for the coming season should now be bedded. It is quite unnecessary to use a hot-bed here. Healthier and hardier plants will spring from bedding in a cold frame, or in clean, sharp sand in a warm situation. Cover lightly with soil, water freely, and protect the young plants from frost with hessian or light bagging. In seasons of drought this tuber is one of the most successful of root crops, and apart from their distinct value as a vegetable for domestic use, we have in them an excellent food for pigs.

Jerusalem Artichokes, Arrowroot, and Chicory.—Towards the end of the month these valuable plants may be planted. The artichoke is a plant the value of which has never been fully estimated for pig food. It is sturdy in character, easily grown, and well repays the farmer for its cultivation.

Lucerne.—This excellent fodder may be sown during the spring months in the coastal districts when frosts are past. There should be at least 2 feet of good soil, well cultivated, free of weeds, in fine tilth, and, if possible, containing a fair proportion of lime.

Grasses.—An opportunity is afforded this month to stimulate growth by running the harrows over the paddocks to break up and distribute manure clods. A chain harrow is best under existing conditions, but in the event of rain falling, quite as an effective appliance is the more economically-constructed brush harrow.

The grass, *Paspalum dilitatum*, continues to maintain its reputation in this district. Possibly it has added to it by the sturdiness and vigour it has maintained throughout the driest season experienced here.

Diagram A

TABLE

Show ng lnat as R nfal for decade for Sydney is high or ow o from the scanty records ain able s the same decade high or lou other par s of New South Wa e

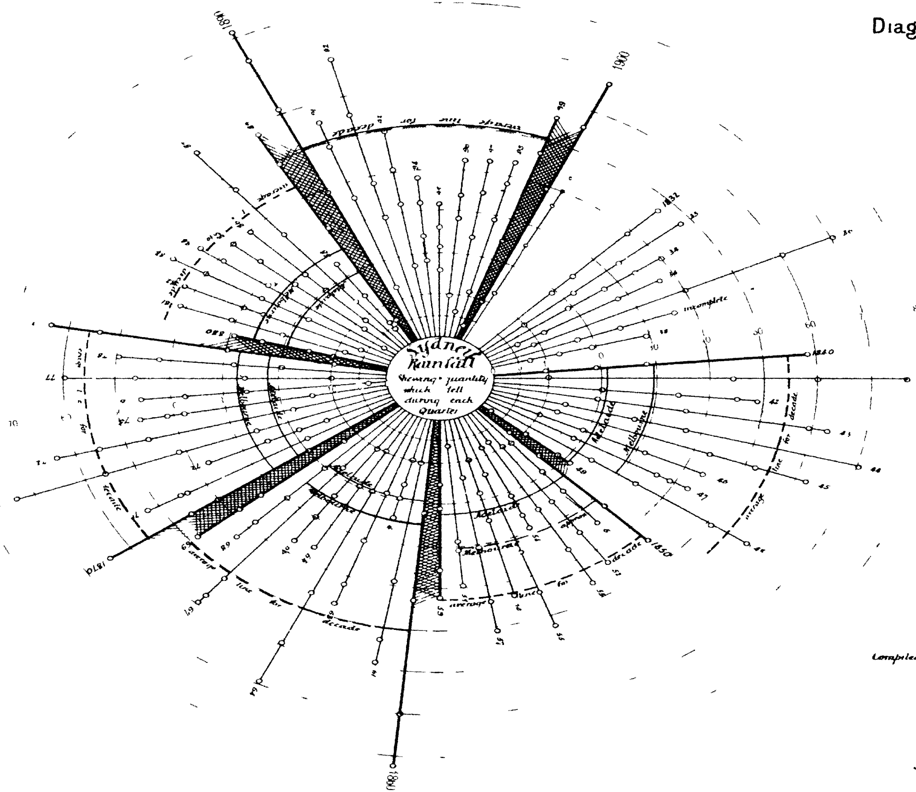
Place	As umed yea y average	1860 1869 med um for Sydney 60 6	1870 t 879 max mum fo Sydney 65 4	1880 o 1889 m n mum for Sydney 42 9	1890 o 1899 med um o Sydney
			Yea y ave age f de ade		
Bombala or Buckalong	27 57	24 6	34 2	23 0	
Mudgee or Burrundulla	25 92		8 5	22 5	8 2
Bathurst	24 54	21 5	6 2	2 8	2(
Dalwood	32 32		33 8	28 1	35
Deniliquin	16 97		19 6	15 6	1(
Kurrajong	52 65		54 7	45 3	56 5
Maryland	35 18		35 4	30 0	
Murray Downs	14 12		18 2	13 1	13 4
Wentworth	12 09		13 5	10 9	1 9
Goulburn	28 41	8	30 7	22 1	26 9
Yanko	17 45		18 8	16 5	

In hes 8(

Also

A omparison of Rainfall at Sydney w th that at Me bourne and A l a de Br bane s Ra nfa l for each decade s very sim ar t that a Sydney

C mpi ed from Offic a Re urn

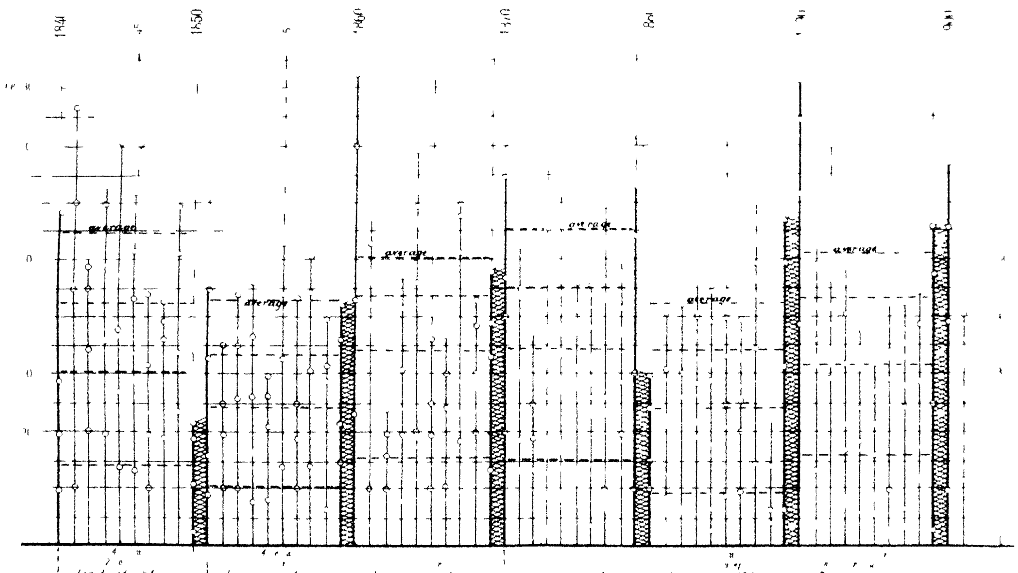


Compiled from Official Records

Diagram A²

SYDNEY RAINFALL

Sh[illegible]ing the quantity which fe[illegible] each Qua[illegible]



TABLE

Sh[illegible] c[illegible]nnec[illegible]n between the Rainfal[illegible] year periods [illegible] Sydney and [illegible] during the same period [illegible] of New South Wales

	Assumed yearly average	1860 to 1869 medium for Sydney	1870 to 1879 maximum Sydney	1880 to 1889 minimum for Sydney	1890 to 899 medium for Sydney
			Year one age in decade		
B[illegible]	27 8	24 6	34 2	24 0	
M[illegible]	25 0		29 5	22	28
[illegible]	24 0	21 5	26 2	22 8	26 0
[illegible]	32 3		33 8	28	36 2
[illegible] Queen	[illegible] 0		19 6	[illegible] 6	16 5
[illegible]	[illegible]		54 7	45 3	58 5
M[illegible]	35		35 4	30 0	
M[illegible] Ocean	4		8	[illegible]	[illegible]4
M[illegible]	[illegible]		3 5	10	0
C[illegible]	26 4	[illegible] 8	30	22 1	26 9
[illegible]	4		18 8	16	
[illegible]	22 4			22 6	25 5
P[illegible]	8			16	[illegible] 6
B[illegible]	16 9			16 8	16 9

C[illegible]mp[illegible] R[illegible]ll

An Analysis of the Rainfall Records of New South Wales generally, and also of those of other States.

JOHN BARLING,
Upper Manilla.

THE importance of the study of the rainfall records of any country, and especially as regards Australia generally, where both pastoral and agricultural pursuits are prosperous, or the reverse of it, according as the rainfall is abundant or scanty, is the reason for now presenting in diagram form the results of a study of the official records available.

For much of the information obtained I have to thank Sir C. Todd of South Australia; H. C. Russell, Esq., C.M.G., of the Sydney Observatory; and C. Wragge, Esq., of Brisbane. It would appear that the irregularity generally ascribed to the rainfall is more imaginary than real—in fact, it appears that the regularity is very marked—and that, as time goes on, when more records are available, an accurate forecast can probably be made for a considerable period in advance. Needless to say, when that time arrives, it will be possible to greatly reduce, or even entirely prevent, the now constantly recurring losses in stock and crops; for if it be known when a succession of dry seasons are due, understocking the country must be resorted to, and its reverse when damp seasons are to follow. Similarly with farming pursuits, especially with wheat and hay crops. The rainfall records in New South Wales, away from Sydney, extend over so short a time comparatively, that these diagrams chiefly relate to Sydney; but, as will be shown, there is a distinct similarity between the Sydney rainfall and that of other places far distant from it, so that, probably, as time goes on, the rainfall for any part of the State can be forecasted from the Sydney records (see Diagrams A and A 2).

The diagrams seem to prove that a maximum rainfall for Sydney for a period of ten years—to take a useful term—is also a maximum period for ten years for any part of the State, and that a minimum period of ten years for Sydney is also a minimum period for ten years for any part of the State; and also that a single year of extreme rainfall for Sydney is an extreme for all the State, and that a minimum year for Sydney is also a minimum for the country (*see* years 1890 and 1888 for both Sydney and Manilla). Manilla only is shown; other parts agree; no records available for 1860 away from Sydney. What the majority of the seasons will be is not yet evident.

It will be seen by Diagrams B and C—1840 to 1849, &c.—that if we start a decade at 1840, a complete pattern is evident. By taking average lines for this series, they run thus:—

Maximum.	Minimum.	Medium.
Maximum.	Minimum.	Medium.

Starting at 1842, the pattern runs:—

Highest.	Medium.	Lowest.
Highest.	Medium.	Lowest.

the range of this series being much less than that of the first.

Starting at 1843-44-45-46-47-48-49, the decades do not give any regular pattern.

As to forecasting the rainfall by these diagrams—take, for example, the period 1892 to 1901, both years included, one would expect this period to match 1862 to 1871, wherein was a total rainfall of 481 inches. At the end of 1899 (eight years) there had been a fall of 374 inches, so that if the diagram were to hold good, the difference between 374 and 481—that is, 107 inches—had to come for 1900 and 1901. Actually during—

1900 there fell ...	67 inches.
1901 " " ...	40 "
Total ...	107 "

thus coming out as diagram indicated.

Both Diagrams B and C seem to show that the decade we are now in, viz., 1900 to 1909, will be a maximum period.

The following table is interesting as giving a possible accurate forecast for 1902:—

1843 to 1852,	both inclusive—a total fall of	487 inches.
1853 to 1862,	" " "	469 "
1863 to 1872,	" " "	494 "
1873 to 1882,	" " "	514 "
1883 to 1892,	" " "	517 "
1893 to 1901,	" (nine years)	411 "

The period 1893 to 1902 is probably one of the driest of the series given above. The driest recorded gave 469 inches for ten years, so that to reach this total 58 inches must fall in 1902—a high record, and much above the usual; or it may have a—

Minimum of	469 — 411 =	58 inches.	
Maximum of	517 — 411 =	106 "	(*a*)
Possible of	514 — 411 =	103 "	(*b*)
" "	494 — 411 =	83 "	
" "	487 — 411 =	76 "	

Such a quantity as (*a*) (*b*) is unknown in Sydney, and, therefore, these two must be disregarded. It looks probable that somewhere about 58 inches will be the fall for 1902.

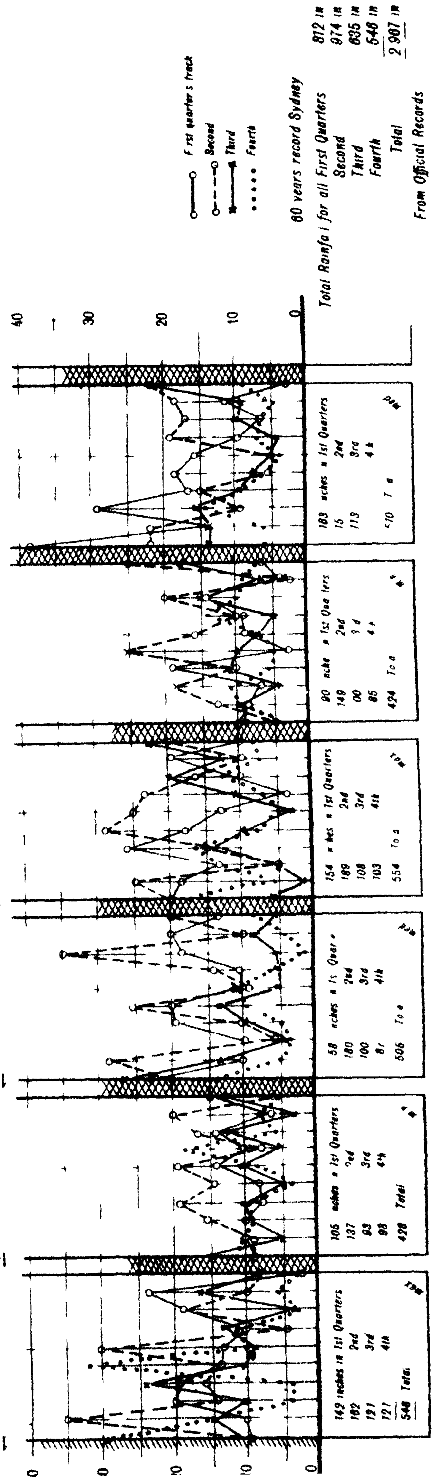

First quarter's track
Second
Third
Fourth
60 years record Sydney
Total Rainfall for all First Quarters 812 in
Second 974 in
Third 635 in
Fourth 548 in
Total 2 967 in
From Official Records

Diagram B.

Diagram C.

SYDNEY RAINFALL

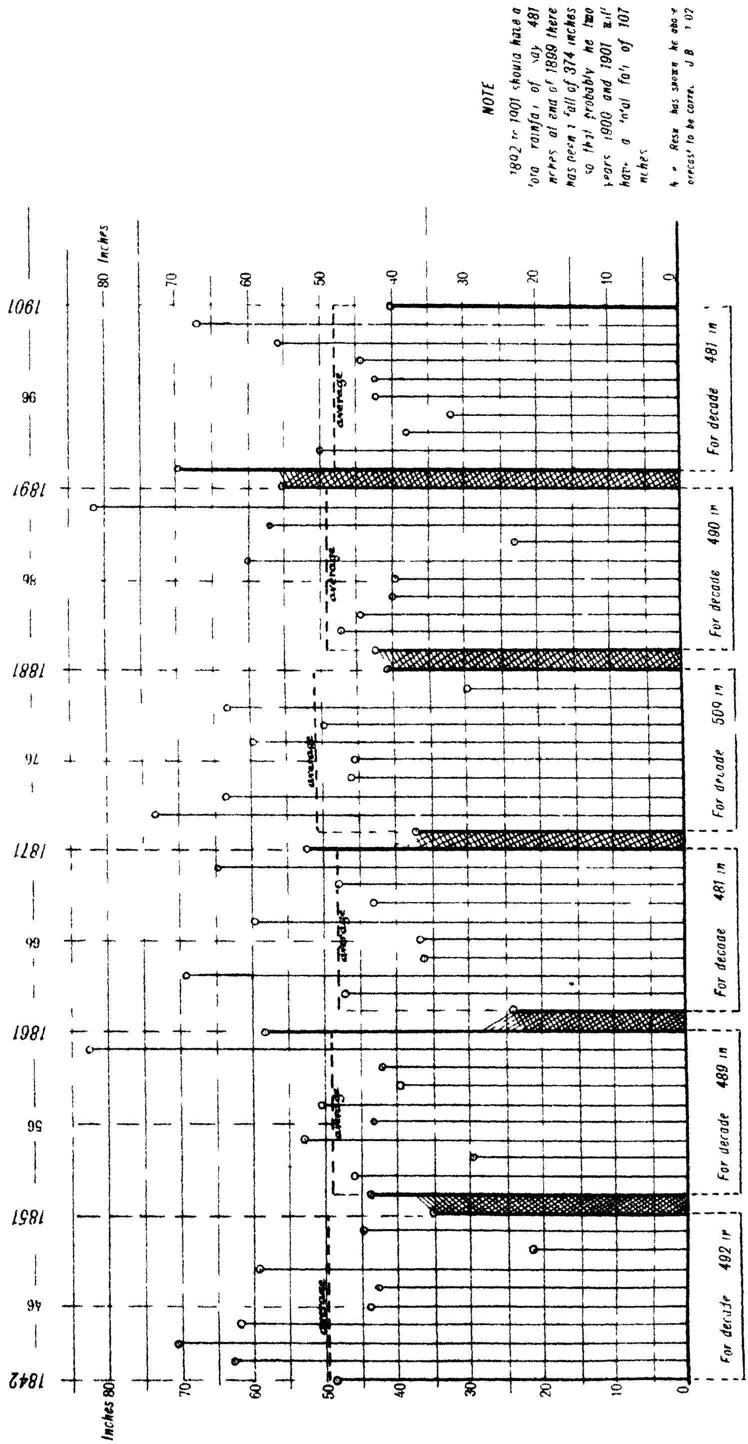
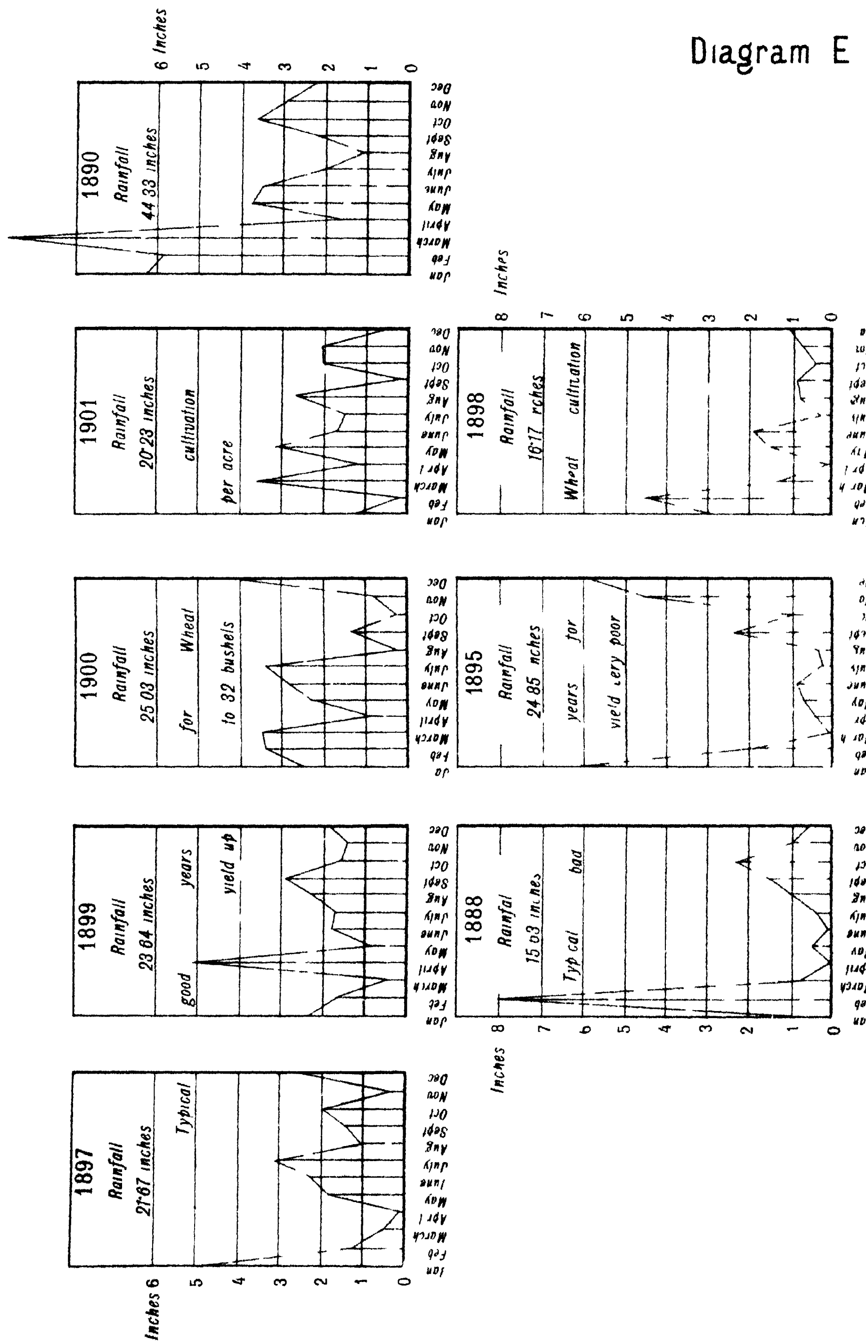


Diagram E


1890
Rainfall
44 33 inches
1901
Rainfall
20·23 inches
cultivation
per acre
1900
Rainfall
25 03 inches
for Wheat
to 32 bushels
1899
Rainfall
23 64 inches
good years
yield up
1897
Rainfall
21·67 inches
Typical
1898
Rainfall
16·17 inches
Wheat cultivation
1895
Rainfall
24 85 inches
years for
yield very poor
1888
Rainfall
15 03 inches
Typical bad
Inches

To show how the above forecast works out. To find what rainfall there should be for 1900:—

					Inches.	
1841 to 1850	both inclusive,	a total	fall of		533	(a)
1851 to 1860	„	„	„		466	(b)
1861 to 1870	„	„	„		486	(c)
1871 to 1880	„	„	„		520	(A)
1881 to 1890	„	„	„		474	(B)
1891 to 1900	„	„	„		495	(C)

The series runs thus:—	Maximum	(a)	Maximum	(A)
	Minimum	(b)	Minimum	(B)
	Medium	(c)	Medium	(C)

One would have expected (C) to be a medium period, and as (B) exceeded (b) by 8 inches, it was reasonable to expect (C) to exceed (c) by 8 inches. From 1891 to 1899, a period of nine years, 428 inches of rain fell; therefore, for 1900 one would have expected a rainfall of (c) 486+8=494 inches−428=66 inches, and this well agrees with what actually fell, viz., 67 inches.

The principal reason for making the inquiries resulting in these diagrams, was the very practical one of attempting to ascertain the suitability or otherwise of the Manilla district for the growth of wheat.

The records for the place extend no further back than 1885, but even this short period seems to be sufficient to arrive at some degree of certainty as to the seasons (*see* Diagram D), in which it will be seen that the large majority of years were distinctly favourable for wheat growing.

Diagram A 2 will explain at a glance that where the rainfall is low for the months April to September inclusive, a poor wheat yield is a consequence (*see* years 1888-95-98); on the other hand a full amount of rain during these months shows an excellent wheat return (*see* years 1897, 1899, 1900-1, 1890).

A comparison with rainfall over agricultural areas in South Australia, where the finest of wheat is grown, shows a great similarity with that at Manilla; so that by plotting the rainfall for any place, if a similar pattern results, other things being equal, it may be concluded that it would be suitable for wheat growing.

For maize growing, on the contrary, the plot should show a full rainfall for beginning and end of the year, but little rain for intermediate months. In fact, a plot would show exactly what crops should be grown in any part of the country.

It is abundantly clear that not the total rainfall for the year is the determining factor in wheat growing, but that even a small rainfall is sufficient for it, if it falls at the right time.

[Mr. Barling has also prepared a large general chart showing the rainfall system for the Eastern half of Australia. The remarkable fact shown by it, is that the lowest part of the country represented on chart, viz., Lake Eyre, below sea level, has also the smallest known rainfall, and that in any direction therefrom there is a steady and gradual increase of rain.]

NOTE.—The lowest rainfall in Sydney for any decade was but 424 inches—1880 to 1889, both years inclusive. Up to 18 July, 1902, the total rainfall in Sydney from 1 January, 1893, = 427 inches; so that it is improbable that the rainfall for 1902 will be as high as given above, viz., 58 inches.

Farm Notes.

RIVERINA DISTRICT.—August.

G. M. McKEOWN.

Lucerne.

Sowing should be carried out without delay according to previous instructions. As good showers have fallen recently, the crop should get a good start in favoured localities.

Potatoes.

Planting should be carried out in August and September. Land should be deeply worked, and brought into as fine condition as possible. Medium-sized potatoes may be planted whole, the larger tubers being cut into sets, each piece having two or three eyes. Drills should be struck out 3 feet apart, 6 inches deep, and the sets planted about 15 inches apart in the drills. Australian Monarch, Early Puritan, Early Ruby, and Bliss' Triumph will be found excellent varieties.

Green Fodder.

Barley may still be sown, in moist situations only, for green fodder. Prepare land for sowing millet and sorghum. Transplant roots of *Paspalum dilatatum*.

Vegetable Garden.

Sow peas, in moist situations, to a limited extent only. Sow tomatoes. Honor Bright, Early Boronia, Duke of York, and Fordhook First have done well here. Transplant cabbage and cauliflower.

BATHURST DISTRICT.—August.

R. W. PEACOCK.

Owing to the drought, which happily received a check throughout the district by the rains of July, a large portion of the cereals will be sown this month. It certainly is too late for the sowing of wheats if fair yields are to be assured.

Oats can still be sown, and should take the place of wheats for sowing for hay during this month. They yield from late sowings comparatively very much more than the wheats.

Barley and rye can be sown for green fodder.

Peas and tares can also be sown, but will not compare for yield with the earlier-sown crops.

Land should be prepared for the various spring crops, such as potatoes, pumpkins, melons, sorghums, millets, maize, &c.

The planting of young deciduous fruit-trees should be completed during the month, as well as the pruning in the orchard.

Vegetables.

Asparagus roots should be planted in beds prepared for their reception, as also rhubarb roots. Onion seed can be sown and seedlings transplanted. Peas and broad beans can be sown; also carrots and parsnips. Cabbage and lettuce plants should be put out, and more seed sown. Tomato seed should be forced for early spring planting, and, if planted out during the month, they will require protection from the frosts, as they rarely cease until October. Land should be prepared for the tomatoes, cucumbers, capsicums, and other spring vegetables.

Green Manures in Orchards.

It is to be feared that very little in the way of autumn-sown crops for green manures has been possible this season. Where, however, there has been rain, and the ground has had a good soaking a fair growth for turning under could be speedily secured if a little care were exercised in getting in the seed at the earliest opportunity. The sort of crop most suitable under the extraordinary conditions that may prevail will depend a good deal on circumstances. Where the land is in fine tilth, and is situated well up on a sunny hillside, there is no reason why a sufficiently luxuriant growth of gray peas, of tares, or of rape might not be made available for turning under before the end of September. In bleaker localities, oats, barley, or rye, especially the last-mentioned, may be depended upon to produce with moderate rainfall a good mass of stuff that will be readily converted into humus.

The need for sufficient humus or decayed vegetable matter in orchard soils is strikingly apparent in seasons like the one we have unfortunately had to endure. In soils that have been enriched with vegetable matter in the shape of liberal dressings of properly rotted bush-rakings, or by means of green crops turned under, the trees have made steady growth, and have borne and are now carrying very fair crops. On the other hand, where no attempt has been made to keep the soil mellow and assist it to retain moisture, the trees are in a pitiable condition and the crops are practically nil. It is to be sincerely hoped that the orchardists of this State may never again experience such a series of dry seasons as we have just been passing through. Still similar conditions may recur, and it is wise to be on the safe side and to take steps to minimise the effects of drought. Green cropping and persistent cultivation are the most effective means in combating drought.

In bearing orchards, spring and summer-grown green crops, like cow pea, which is probably the finest plant for the purpose, are not desirable; but there is nothing to prevent the growth of such crops in young orchards. In speaking about green manures for orchards, Mr. G. F. Bray, of Castle Hill, says:—"Last year I sowed gray peas, about one bushel per acre. I find that the green manure kept my ground mellow and in good order during the summer. I also tried manure, but find that peas give the best result, and cost only about a quarter the amount. I sow during April and May, and plough in when the pods are forming. During the summer I keep the soil well worked."

Orchard Notes.

W. J. ALLEN.

AUGUST.

AUGUST is one of the busiest months in the orchard. If young deciduous trees have not already been set out no time must be lost now in planting. When setting out the young trees it will be well to have the soil in as good condition as possible, and to take particular care that in transportation of the trees from the nursery and in the operation of trimming roots that the latter are not exposed too much to the sun and wind. Directions for the pruning back of young trees were issued in the special article on "Pruning," in the *Agricultural Gazette* for June. [I should like to point out, however, that in arrangement of the cuts, figures 5 and 11 have become transposed.] Ground for young citrus trees should be well prepared, and if the weather is favourable, and there is sufficient shelter from severe frosts, planting out may be commenced towards the end of this month. In the selection of varieties of citrus fruits, too much care cannot be taken to obtain yearling trees of good constitution and of profitable varieties. Where the soil is deep, well-drained, and fairly rich, the Washington Navel, Valencia Late, Mediterranean Sweet, and Joppa are to be recommended; for the lighter, shallower soils containing loose ironstone, Siletta and St. Michael oranges seem to do better than the newer kinds. The Seville orange also does fairly well in indifferent soil. The Emperor Mandarin seems to stand first as an early yielder of profitable crops, and the Thorney follows. But for medium to good soils, the Beauty of Glen Retreat, which is something like the Scarlet in colour of the rind, is to be preferred, as it not only comes into heavy bearing at an early age, but the extremely thin-skinned, fleshy fruit is of a quality that must win recognition.

In lemons there is not a very wide choice, the Lisbon and Villa Franca being the two most commonly preferred.

In most districts the lemon-tree, as commonly grown on lemon stock, is neither a healthy tree nor a long-lived one. Hundreds of young lemon trees succumb every year to attacks of collar-rot which is generally attributed to inefficient drainage. In young orchards perfect drainage cannot always be provided for at first, and as a safeguard against loss of trees and the expense incurred thereby, the use of orange stocks for lemons is to be strongly recommended. In some places orange stocks are used successfully for all classes of citrus trees, and as our experience of these stocks increases, I think it will be noticed that the lemon stocks are being more and more discarded.

Details of pruning will be found in the special articles on the subject, commencing in June issue, and continued in last month and this number.

As soon as possible after the completion of pruning, any manure that is available should be spread over the land, which should then be ploughed as deeply and thoroughly as possible and left rough.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

DIRECTIONS FOR THE MONTH OF AUGUST.

Vegetables.

THE season has, up to the present, been so mild that there is every reason to expect that spring will begin about the early part of August, therefore preparations for sowing and planting spring and summer vegetables should be under way.

Judging from late satisfactory rains in many parts of the State, particularly in the coastal districts, everyone who takes the trouble to grow vegetables should have an abundant supply, with good prospects of a satisfactory continuance. Where the rains have been heavy, weak places in drainage have become very evident.

August is a time of year when a deal of important work can be performed, both in the vegetable and flower garden, in planting and in sowing seeds, in cleaning up the garden, and in putting matters shipshape for the spring.

Asparagus.—This can be planted at any time during the month that may be convenient; but where the plants are starting into growth, they had better be put in without delay. Before planting, all the asparagus plants had better be carefully looked over, and all bruised and broken roots should be removed. Inferior plants, with small and weak crowns, had better be picked out and planted in a bed by themselves. Planting had better be carried out with a good deal of care, and on no account should the roots be bunched up in a heap together, but should be spread out to their full extent, and the soil filled well in between them. To succeed in doing this the trenches in which they are to be planted should be made sufficiently wide in the first instance. The depth of the trenches should be so regulated that when the surface soil is covered over the plants, and the work of planting completed, the crowns of the plants should be about 2 inches below the surface of the soil. Those readers who have well-established plants of asparagus who wish to grow thick white shoots should give their plants a good soaking of liquid manure, and spread a covering of stable manure, which has been well rotted, over the asparagus bed to a depth of about 6 inches or so. This should be lightly forked over, so that it may not become consolidated. A dressing of well-rotted leaves would answer the same purpose. Take care that they are well rotted, for fresh or half-rotted stuff might be worse than useless, especially if they are gum (eucalyptus) leaves.

Artichoke, Globe—Suckers, or young plants, may be planted. Two or three will probably be all that one ordinary family would require.

Artichoke, Jerusalem.—This should be planted during the month, and the earlier the better. Do not neglect to plant this vegetable, for it is a good and wholesome one. If there should be a surplus of roots, the pigs will make the best possible use of them. It seems

rather surprising that our farmers do not make more use of this useful food for man or stock. In good soil it is wonderfully prolific and easily grown; and if it be specially grown for pigs there need be no trouble about the harvesting, for the pigs will very soon accomplish all that is necessary. A few hurdles only will be required.

Beans, French or Kidney.—Wherever frosts are over seeds of this good summer vegetable may be sown. Manure well with farmyard manure. Sow in drills about 2 feet 6 inches or 3 feet apart for dwarf varieties, and 4 feet or more for runners. Make the drills about 3 inches deep, and drop the beans along the bottom of the drills from 4 to 8 inches apart. When the plants appear above ground, cultivate well between the rows, and prevent weeds growing.

Beet, Red.—Sow a little seed from time to time during the month. Obtain the very best seed available, and before sowing its germination can be hastened if it be soaked for a few hours in water, or kept in damp sand; but if this course be adopted, and the soil is very dry at time of sowing, the seeds may perish, unless after the sowing the drills be well watered. Sow in drills about 18 inches apart, about 1 inch deep; cover the seed with fine soil. When the young beets have grown to a height of 3 or 4 inches, thin out to about 9 inches or 1 foot apart. The best beets will be found amongst the Globe varieties.

Beet, Silver.—Sow as directed for red beet, or sow in a small bed, and the plants can be afterwards planted out in heavily-manured ground. This is one of the most useful of vegetables, and is well worth a trial by those who are not acquainted with it. Its leaves are used, and not the roots. The outside leaves can be pulled as they become large enough, and if only one or two are taken from each plant at a time the beets will continue to bear for a considerable period.

Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Savoy.—Sow seed of these varieties of cabbage from time to time during the month; but as they are somewhat difficult to grow in the summer if the weather is dry, it would be prudent not to sow very much seed, or to raise plants which cannot be made use of. Plants of the above may be planted out a few at a time during the month, in ground that has been heavily manured for them. The cabbage tribe are gross feeders, and can make use of any amount of manure, but well-rotted manure should be used if possible, to prevent rankness.

Celery.—A sprinkle of seed may be sown in sufficient quantity to keep up a supply of plants. Prick out from previous sowings, in order to grow good, strong, well-developed plants for planting in trenches. If any plants are ready, plant a few at a time, unless a large supply is required; if so, plant out to meet requirements. Make the soil in the trenches as rich as you can before planting. Advanced plants may be earthed up with soil or any material that will keep the light away from the stems. Try the White Plume, for it is a good sort, and will almost blanch itself if planted thickly. Celery is a most useful vegetable, for any that may not be required for salad purposes may be cooked and served with melted butter. Celery is a most useful addition to soups, and doubtless an ingenious housewife could find uses for it in multitudinous ways.

Celery, Turnip-rooted.—Generally known as celeriac. A variety which bears a thick, short, stumpy-looking root or prolonged underground stem. Useful to grow for cooking chiefly. It does not need earthing up like the ordinary celery. Use plenty of manure.

Carrot.—Sow a few seeds from time to time during the month. This is one of the most useful of the vegetables; very wholesome and nutritious. Sow in drills, about 1 foot apart, an inch deep. The seed is slow in germinating, and as the plants are rather tender when young, weeding is very necessary. Obtain seed of the short-rooted varieties, if sowing for home use, for they are the best. Large carrots make excellent feed for horses and cattle for a change, but they should be sliced, to prevent risk of choking.

Cucumber and Melons.—Seed may be sown in warm situations free from frosts. Plants in cold places can be raised under shelter, for planting out when the weather is quite warm.

Leek.—Sow a little seed now and then in seed-bed, to keep up a supply of young leeks for planting out in shallow trenches made very rich with an abundance of manure. Plant out enough for requirements from previous sowings. The leek needs a considerable amount of water during its growth. Liquid manure will be found most beneficial if good specimens are required.

Lettuce.—Sow a little seed occasionally in seed-bed, and plant out any young lettuce on hand that are large enough to shift. Move the lettuces with care, and avoid breaking more roots than possible. Use a heavy dressing of well-rotted manure, and quicken growth with occasional applications.

Onion.—Seed may be sown as extensively as required, for the present time of year is a good one to sow this crop. Where seedling onions have already been raised for the purpose of transplanting, they may be set out as soon as the ground is ready for them. This is the best system for those to adopt who merely grow the crop for domestic use. When transplanting, remove an inch or two of the tops, according to the size of the onions, and trim off the long roots. Use plenty of manure for onions and keep them quite clear of weeds. If the old system of sowing the onion seed where the plants are to grow be adopted, sow in drills about 12 or 18 inches apart. The surface soil should be made as fine as possible, and the seed, after it is sown, should be covered very lightly with fine soil. A very light roller might be used with effect.

When the plants are large enough, thin them out to about 6 or 8 inches apart.

Parsnip.—For this vegetable the ground should be dug deep, to enable the roots to extend without hindrance, for the parsnip is a deep-rooting plant. It would be advisable to use ground for this vegetable that had been heavily manured for some vegetable, such as cabbage, which has recently been removed. Fresh manure for this, or for carrots, is not advisable.

Peas.—Sow extensively during the month, from time to time, in order to keep up a succession of one of the best vegetables we have. Sow in drills from 3 to 4 feet apart. For the dwarf kinds, 18 inches

to 2 feet apart will be sufficient. Sow about 3 inches deep in the drills, and drop the peas about 4 inches apart.

Potato.—Plant a few rows, preferably of an early variety, such as Early Rose. It will probably be difficult to obtain good seed this season, as potatoes are scarce; but do not plant any potatoes that are at all scabby, however scarce good seed-potatoes may be. Use a good deal of manure, well rotted if possible. Make the drills about 3 feet apart, and drop the potatoes about 1 foot apart in the drills, which should be about 6 inches deep.

Radish.—Sow a few rows occasionally during the month.

Rhubarb.—This should be planted during the month, for the shoots are likely to start into growth very soon. Prepare the ground as recommended for asparagus, and plant carefully, and so deep that the crowns of the rhubarb plants are about 2 inches below the surface of the ground when the soil has been covered over them. The distance from plant to plant should be about 3 to 4 feet.

Turnips.—Sow a little seed occasionally during the month, in drills about 1 foot or 18 inches apart. The seed should be sown about an inch deep. Keep the young turnips well weeded when they come up by stirring the soil frequently between them.

Flowers.

The spring flowers should be making themselves very conspicuous during the month, except in the cold, late districts. Daffodils and other members of the Narcissus family should be in fine bloom, but the late dry season has by no means been favourable to them. Early flowers of anemones, and some of the ranunculuses, and many beautiful bulbous plants, should begin to produce their flowers during August. Perhaps the most important work to be performed in the garden will be the pruning of the roses, which may take some time if the collection is a large one. For this work use a good pruning-knife, and keep it as sharp as you can. However good and useful the pruning-shears or secateurs may be in the orchard, they should have no place in the flower-garden. Pruning with a knife, assisted by a saw, is very much harder work than pruning with the secateurs, and the pruner will certainly suffer from many thorn-scratches; but he will find that the inconveniences, with a little blood-letting, more than compensated for by the results. When pruning clear away, first of all, any wood that may have died during the past season. Sometimes there is a good deal from one cause or another, and very often in consequence of the attacks of scale insects. Clear away all useless, weak, tangled growth, in order to encourage clean, healthy, vigorous shoots, and cut back long branches about two-thirds of their length. The general rule adopted in pruning roses is to cut hard back those kinds which produce weak wood, but only prune moderately the kinds which are vigorous growers. The main objects in pruning are to cause the growth of flower-bearing wood and to keep the plants in good shape and within bounds, although some of the climbing varieties succeed best when allowed to grow and ramble as they please.. When the roses are pruned, clear away all rubbish, apply a

good heavy dressing of farmyard manure, and spade it in; or, if a heavy mulch had been spread in the summer, spade that in, and later on spread a new mulch. Any deciduous plants in the garden should be pruned in the early part of the month if they need it. Evergreen plants and shrubs of all sorts should be planted as soon as possible, and, as the early spring may possibly be very warm, they may need to be well looked after. Hardy and half-hardy annuals of all sorts should be planted out without delay, and seeds of tender annuals may be sown, except in the cold climate districts.

Co-operation in Marketing Garden Produce.

As far as one can judge by watching the consignments of vegetables for sale in the metropolis it is pretty certain that within a few years the greater part of the cabbage, cauliflower, pea, bean, tomato, and rhubarb raising will be in the hands of communities of small European growers. Already a good many orchardists supplement their fruit returns with occasional—in some cases regular—croppings of cauliflowers, cabbages, turnips, peas and beans, and most of them do well so far as the selling price is concerned, but the costs of marketing, as a rule, leave no very wide margin of profit. This state of things will last so long as every grower remains isolated in his arrangements for transit. If all, or the greater number of, vegetable growers in a district could have some sort of a club, or some means of keeping more in touch with each other, they would be able to act in concert, and save many pounds in the marketing of their produce, in the purchase of manures, and in many other ways. Very often one will see a ton of garden produce costing as much for transit as a whole truck would. The railway authorities are always ready to promote the welfare of an industry by liberal concessions in bulk freights, and there can surely be no sense in Smith, Brown, and Jones each paying full truck rates for their third of a truckful of produce when the three of them in combination could secure the privilege for a third of the money.

As an instance of what co-operation means in the case of vegetable growing for a large city, the case of the Long Island Cauliflower Growers' Association may be cited. The eastern end of Long Island is occupied by small farmers. The district is peculiarly adapted for cauliflowers, and of recent years the farmers have gradually got into the way of augmenting their usual operations with crops of this useful vegetable. No one goes in for a very large acreage, the average area per farm devoted to the cauliflower crop barely reaching five acres. Up till quite recently the cities of New York and Brooklyn were the only markets, and, as the output of cauliflowers increased, these markets were glutted when the bulk crops of individuals all acting irrespective of each other were sent in. The result was decreased profits for the growers, and no particular advantage to anybody. Growers vented their disappointment on the commission agents, whom they suspected of returning the low prices reputed on the New York market, and then re-selling, on consignment to distant cities, the produce at handsome

profits. This worry brought the growers together a bit, and the outcome of their deliberations was the formation of a Cauliflower Growers' Association. The membership fee at first was fixed at £1 per acre, but it was soon found to be unnecessarily high, and has now been reduced to 2s. per acre. The Association was fortunate in securing an energetic general manager, who had information as to the condition of markets reported daily by wire, and shipments could thus be made to the most favourable degree. The great bulk of the crop went to New York and Brooklyn as hitherto, but enough was diverted to distant cities to avoid glutting New York, and the result was the most satisfactory range of prices received for years. The control of the Association is under a board of directors, one at each station, and other officers, all elected by the members.

The great point about the operations of this Cauliflower Growers' Association, and the one that is worthy of careful consideration on the part of New South Wales market gardeners, is the fact that at the end of the first season the 500 growers on the members' list found that all the expenses of the organisation had been covered by the savings in freight by the Association, which shipped in full car lots. Where individual growers shipping small lots on their own account had to pay 1s. 9d. per package, the Association could ship in bulk lots for 10½d. a package. On a full carload of 200 packages some £9 10s. would be received by the Association. To do this it shipped to one consignee, who attended to the distribution of the produce to the various commission agents chosen by individual members of the Association, paid the rail freight, and remitted the balance. No attempt is made to control the growers in their selection of commission men; each ships to whom he pleases, the Association merely controlling delivery. The plan works smoothly and satisfactorily. At the end of their first season the Association found themselves with a balance of over £200 to the good in the treasury, and about half surplus was expended in compensating members for lost empties.

Pepper-trees for Bees.

Mr. C. F. Edwards, of Henty, writes:—"The past season has not been a very good one for bees. Noticing bees very busy upon pepper-trees at a friend's place, I thought I would get some pepper-trees to plant for my own bees; but a farmer who had kept bees when in Victoria said the honey from pepper-trees was always of a very bad colour, being nearly as dark as treacle. Another bee-keeper informed me that bees do not gather honey from these trees at all; it is pollen they obtain. I would like the Department's opinion before planting, because I get a first-class honey now, and would not like to run the risk of it losing its good name in the district."

Mr. Albert Gale reports:—"Pepper-trees are unisexual, *i.e.*, one tree (the male) produces pollen, and the other (the female) seeds. For pollen the male trees are useful. Honey from pepper-trees is not of a high quality; nevertheless, it is very useful for feeding back to bees, especially in such seasons as we are now having."

Market Review.

Board for Exports, Bridge street,
Sydney, 21 July, 1902.

POULTRY, &c., received at the Government Cold Storage Depot

Date	Fowls	Ducks	Geese	Turkeys	Rabbits	Hares
1902					pairs	
January	6,266	1,677	197	372	576	
February	12,593	3,416	326	297		
March	17,228	2,087	324	846	6,502	80
April	25,011	4,916	257	186	9,751	896
May	22,605	2,382	42	440	36,828	1,800
June	9,754	971	26	288	32,756	17,848
Totals	9[illegible],157	15,449	1,172	2,429	86,413	20,624

Besides the above, the following were received:—

1902		
January	270 packages butchers' sundries	
February	296 ,,	,,
March	655 ,,	,,
April	225 ,,	,,
May	218 ,,	,,
June	187 ,,	,,
Total	1,851 ,,	,,

Poultry, &c., delivered from the Government Cold Storage Depot

Date	Fowls	Ducks	Geese	Turkeys	Rabbits	Hares
1902					pairs	
January	9,548	1,166	183	170	1,566	96
February	12,921	1,075	563	517	348	300
March	11,833	2,018	390	630	3,709	136
April	10,645	2,192	332	213	4,896	122
May	22,944	3,172	89	479	8,679	972
June	5,383	459	28	226	15,699	5,248
Totals	73,274	10,082	1,585	2,235	34,897	6,874

Besides the above, the following were delivered:—

1902			
January	609 packages butchers' sundries		94 cases eggs
February	262 ,,	,,	314 ,,
March	667 ,,	,,	536 ,,
April	225 ,,	,,	970 ,,
May	234 ,,	,,	1,250 ,,
June	161 ,,	,,	623 ,,
Totals	2,158 ,,	,,	3,787 ,,

I AM indebted to the Collector of Customs, Sydney, for the following Return of Exports from Sydney of the undermentioned products:—

Date.	Butter.	Wheat.	Flour.	Frozen Beef.	Frozen Mutton.	Canned Meats.
1902.	lb.	bush.	tons.	qrs.	carcases.	cases.
Jan. to Feb....	1,096,536	2,269,220	3,549	8,047	181,943	57,835
March ...	148,120	308,048	1,217	13,102	49,356	30,947
April ...	205,516	177,476	2,255	3,277	41,258	17,170
May ..	104,104	4,696	1,760	2,356	50,669	27,186
June ...	119,672	732	1,527	1,547	37,671	33,913
Totals ...	1,673,948	2,760,172	10,308	28,329	360,897	167,051

Shipments of Butter in the month of May were as follows:—

To Natal ...	....	526 boxes.
Hong Kong ...	....	50 ,,
Noumea ..	21 cases	41 ,,
Manila...	....	1 box.
Japan ...	....	8 boxes.
Thursday Island	1 case	....
S.S. Islands ...	19 cases	....
Totals ...	41 ,,	626 boxes.

Shipments of Butter in the month of June were as follows:—

To Durban	....	42 boxes.
Natal	....	200 ,,
Hong Kong ...	4 cases	48 ,,
Japan ...	....	4 ,,
Noumea	5 cases	14 ,,
Manila ..	25 ,,	....
Thursday Island	3 ,,	....
S.S. Islands ...	34 ,,	8 boxes.
Totals	71 ,,	316 ,,

Quantities of Wheat, Flour, &c., shipped during the month of May:—

Wheat ...	bags	559	Oats ...	packages	34
Flour ...	sacks	2,786	Maize...	sacks	11
,, ...	half sacks	80	,, ...	bags	64
,, ...	qr. sacks	201	Bran ...	bags	469
,, ...	bags	781	,, ...	sacks	40
,, ...	cases	40	,, ...	tanks	2
Sharps ...	sacks	983	,, ...	ton	1
,, ...	bags	172	Pollard ...	bags	134
Oats ...	sacks	256	,, ...	cases	22
,, ...	bags	35	,, ...	tanks	1

Quantity of Wheat, Flour, &c., shipped during the month of June:—

Wheat ...	bags	15	Sharps ..	bags	44
Flour...	sacks	1,833	Oats ...	sacks	60
,, ...	half sacks	20	,, ...	bags	63
,, ...	qr. sacks	418	Maize...	bags	5
,, ...	bags	1,067	Bran ...	bags	175
,, ...	cases	130	,, ...	tons	3
,, ...	pkgs.	6	Pollard ...	bags	42
Sharps ..	sacks	1,421	Rye-meal ...	cases	25

Shipments of Meats in the month of May were to—

London—21,478 crcs., 2,448 bags legs, 1,995 pcs. legs, 325 cs. mutton, 471 pcs. beef, 4,387 cs. meats, 150 cs. rabbits, 127 bxs. kidneys, 2 cs. pork.

Liverpool—640 crts. rabbits, 12 crts. hares, 500 cs. meats.

Capetown—4,642 crcs. mutton, 50 crcs., 75 sides veal, 999 sides pork, 1,925 cs. meat, 59 crts. poultry, 4 crts. hares, 10 cs. tongues, 3 cs. kidneys, 1 bag livers, 105 crts. frozen sundries.

Capetown—Natal—9,380 crcs. mutton.

Durban—10,351 crcs. mutton, 1,236 qrs. beef, 75 sides veal, 19,326 cs. meats, 468 crts. poultry, 21 cs. rabbits, 6 cs. hares, 8 crts., 83 pkgs. frozen sundries.

Natal—7,309 crcs. mutton, 350 crcs. lamb, 310 qrs. beef, 323 sides veal, 484 crcs. pork, 613 crts. poultry, 78 crts. rabbits, 57 crts. hares, 80 cs. kidneys, 9 cs. tongues, 8 cs. sheeps heads, 1 cs. meats, 631 crts., 92 pkgs. frozen sundries.

Colombo—1,075 crcs., 100 pcs. legs, 48 saddles mutton, 370 crcs. lambs, 40 rumps and loins, 12 qrs. 10 cks. beef, 10 crts. rabbits, 2 crts. hares.

South Sea Islands—542 cs. meats, 18 cs., 5 kgs., 2 pkgs. beef, 6 bags, 3 cs., 1 pkg. bacon, 3 cs. hams, 1 cs. ham and bacon, 2 crts. poultry, 1 cs., 1 kg. tongues.

Noumea—185 kgs., 5 cs. beef, 152 cs. meats, 14 bgs., 4 cs. bacon, 1 cs. hams, 4 cs. tripe, 1 cs. tongues.

Victoria (B.C.)—215 cs. meats.

Vancouver—15 cs. meats.

Bombay—101 boxes meats

Thursday Island—4 crcs. lambs, 6 cs. rabbits, 4 cs. tongues.

Genoa—11 cs. meats.

Shipments of Meats in the month of June were to—

London—4,337 crcs. mutton, 509 qrs. beef, 335 crts. hares, 6,645 cs. meats.

London South Africa—4,288 crcs. mutton.

Liverpool—1,146 crts. rabbits, 20 crts. hares.

Capetown or Durban—11,509 crcs. mutton, 23,381 cs. meats, 8 bags frozen sundries.

Capetown Natal—5,098 crcs. mutton.

Capetown—584 crcs. mutton, 150 crcs. lamb, 2,000 sides pork, 100 sides veal, 354 cs. meats, 18 crts. poultry, 32 crts., 12 cs. frozen sundries.

Natal—3,990 crcs. mutton, 350 crcs. lamb, 586 crcs. pork, 47 sides veal, 201 crts. poultry, 20 crts. hares, 10 crts. rabbits, 591 pkgs. frozen sundries.

Durban—1,211 crcs. mutton, 200 sides veal, 2,484 cs. meats, 5 crts. poultry, 30 cs. sausages, 150 pkgs. frozen sundries.

Beira—1,290 crcs. mutton, 273 cs. meats, 4 crts. poultry, 14 bxs. frozen sundries.

South Africa—528 cs. meats.

Hong Kong—1,000 crcs. mutton, 200 crcs. lamb, 26 loins and rumps, 25 ribs beef, 60 crcs. pork, 50 crts. hares, 50 crts. rabbits, 2 cs. sausages, 1 ham, 1 side bacon.

Colombo—700 crcs., 48 saddles, 100 pcs. legs mutton, 120 crcs. lamb, 52 pcs. 7 brls. beef, 10 crcs. veal, 10 crts. racbits, 2 crts. hares.

Manila—800 crcs. mutton, 28 crcs. pork, 84 crts. rabbits, 32 crts., 27 pkgs. poultry, 27 cs. livers, 4 csks. tongues, 1 cs. sweetbreads.

Noumea—165 kgs., 25 cs. beef, 10 cs. mutton, 103 cs. meats, 5 cs. tongues, 7 bgs., 3 sks., 2 cs. bacon, 1 bag hams.

South Sea Islands—14 kegs, 20 brls., 46 cs. beef, 6 cs. mutton, 147 cs. 3 bxs. meats, 4 cs. tongues, 2 cs. bacon, 2 cs. hams, 1 cs. ox cheeks.

Thursday Island—40 cs. meats, 1 keg pork.

May shipments of wool amounted to	... ...	12,139 bales.
June ,, ,, ,,	... ...	11,258 ,,

For 12 months ended June 30, 1902, the total shipments of wool was 657,243 bales.

Market quotations Sydney, are :—

Flour—City roller, £9 10s.; lower grades, £8 10s. to £9; Manitoba, £12 10s. per ton.
Wheat—4s. 5d. per bushel.
Bran and Pollard, 1s. 4d. per bushel.
Maize—Prime, 4s. 10d. per bushel.
Oats—Local prime, 3s. 6d.; Algerian, 3s. 5d. per bushel.
Barley—Cape, 4s.; English, 3s. 9d. to 4s. per bushel.
Lucerne—New dry brown, £7 15s.; green, £8 per ton.
Chaff—Local, £5 15s. per ton.
Oaten Hay—To £6 15s. per ton.
Onions—£7 15s. per ton.
Potatoes—Prime Tasmanian, to £5 10s. per ton.
Butter—Pasteurised, 1s. 5½d.; prime factory, 1s. 4½d.; New Zealand 1s. 4½d. per lb.
Cheese—Local prime loaf, 8d. per lb.
Bacon—Sides, 8½d.; flitches, 8d.; middles, 9½d. per lb.
Hams—Colonial, in cloth, 10d. to 10½d. per lb.
Eggs—North Coast, 1s 5d.; South Coast, 1s. 6d.; suburban, new laid, 1s. 7d. per dozen.
Poultry—Hens, to 3s. 3d.; roosters, to 4s.; ducks, 3s. 9d. to 4s.; geese, to 6s.; turkey hens, to 6s.; gobblers, 8s. per pair.
Hares—7s. to 12s., rabbits, large, to 9s. per dozen pair.
Honey—Prime, 3¾d.; medium, to 3½d. per lb.
Oranges—Local, prime, to 11s,, medium, to 6s.; navel, choice, to 16s. per case.
Tomatoes—Choice, to 5s. per half case.
Passion fruit—Best quality, to 9s. per case.
Pineapples—To 9s.
Lemons—Prime, large, to 10s per gin-case.
Mandarins—Prime, to 7s. per half case.
Bananas—Prime Fiji, to 5s. per bunch; 10s. 6d. per case.

H. V. JACKSON,
Secretary, Board for Exports.

AGRICULTURAL SOCIETIES' SHOWS, 1902.

Society.	Secretary.	Date.
Dapto A. and H. Society	A. B. Chippindall	Jan. 8, 9
Albion Park A. and H. Association	W. J. Ziems ...	,, 15, 16
Kiama A. and H. Society	James Somerville	,, 25, 27
Wollongong A., H., and I. Association	J. A. Beatson ..	Jan. 30, 31, Feb. 1
Berry Agricultural Association	A. J. Colley ...	Feb. 6, 7
Lithgow A., H., and P. Society	M. Ashe	,, 12, 13
Manning River A. and H. Association (Taree) ...	S. Whitbread ...	,, 13, 14
Alstonville Agricultural Society	Henry R. Elvery	,, 18, 19
Moruya A. and P. Society	J Jeffery ...	,, 19, 20
Candelo A. Association	C. H. Brooks ...	,, 26, 27
Ulladulla A. and H. Association	C. A. Cork ...	,, 26, 27
Tumut A. and P. Association	Bland Clayton ...	,, 26, 27
Robertson A. and H. Society	R. G. Ferguson...	,, 27, 28
Port Macquarie and Hastings District A. and H. Soc....	J. Y. Butler ...	,, 27, 28
Braidwood P. and A. Society	G. F. Taylor ...	March 4, 5
[illegible] I. Society	A. R. Payten ...	,, 4, 5,
[illegible]., A., and M. Society ...	E. W. Hosking ..	,, 4, 5, 6 Sale days 7, 8
Cobargo A., P., and H. Society	Thos. Kennedy...	March 5, 6
Berrima District (Moss Vale)	J. Yeo	,, 6, 7, 8
Bangalow A. and I. Society	G. Noble ...	,, 11, 12
Queanbeyan P. and A. Association	A. W. Moriarty...	,, 11, 12
Glen Innes and Central New England Combined District Show	George A. Priest	,, 11, 12, 13
Castle Hill and District A. and H. Association	Frank H. G. Rogers	,, 12, 13
Bega A., P., and H. Society	J. Underhill ...	,, 12, 13
Nepean District P. and A. Society (Penrith)	E. K. Waldron...	,, 12, 13, 14
Oberon A., H., and P. Association	W. Menehan ...	,, 13, 14
Goulburn A., P., and H. Society	J. J. Roberts ...	,, 13, 14, 15
Gulgong A. and P. Association	J. E. Hilton ...	,, 14, 15
Gulgong A. and P. Association	C. E. Hilton ...	,, 14, 15
Walcha P. and A. Society	F. Townshend ...	,, 18, 19
Blayney A. and P. Association	H. R. Woolley ...	,, 18, 19
Bombala Exhibition Society	R. N. Cook ...	,, 18, 19, 20
Cumnock P., A., and H. Association	W. L. Ross ...	,, 19
Cooma P. and A. Association	Chas. J. Walmsley	,, 19, 20
Upper Hunter P. and A. Association (Muswellbrook) ..	Pierce Healy ...	,, 19, 20, 21
Inverell P. and A. Association	T. P. Borthwick ..	,, 19, 20, 21
Camden A., H., and I. Society	C. A. Thompson...	,, 19, 20, 21
Macleay A., H., and I. Association (Kempsey) ...	E. Weeks ...	,, 19, 20, 21
Crookwell A., P., and H. Society	M. P. Levy ...	,, 20, 21
Gundagai P., A., H., and I. Association	A. Elworthy ...	,, 20, 21
Central Richmond River (Coraki) A. Society	D. Cameron ...	,, 20, 21
Mudgee A. Society	J. M. Cox ...	,, 20, 21
Armidale and New England P., A., and H. Association	W. H. Allingham	,, 25, 26, 27
Royal Agricultural Society of N.S.W.	F. Webster ...	,, 26–Ap. 2
Durham A. and H. Association (Dungog)	Chas. E. Grant...	April 9, 10
Quirindi District P., A., and H. Association	Geo. Haughton...	,, 9, 10

Society.	Secretary	Date.
Bathurst A., H., and P. Association	W. G. Thompson	April 9, 10, 11
Hunter River A. and H. Association, West Maitland	W. C. Quinton	Apr. 15, 16, 17, 18
Liverpool Plains (Tamworth) P., A., and H. Association	J. R. Wood	April 16, 17
Lismore Agricultural and Industrial Society	T. M. Hewitt	„ 16, 17
Orange A. and P. Association	W. Tanner	„ 16, 17, 18
Namoi P., A., and H. Association (Narrabri)	J. McCutcheon	Postponed.
Wellington P., A., and H. Association	Jas. Thompson, jr.	Apr. 23, 24, 25
Richmond River A., H., and P. Society (Casino)	J. T. Tandy	„ 24, 25
Warialda P., A., and H. Society	W. B. Geddes	„ 30–May 1
Lower Clarence Agricultural Society (Maclean)	Geo. Davis	„ 30 „ 1
Newcastle and District A., H., and I. Association	M. A. Fraser	May 2, 3
Clarence P. and A. Society (Grafton)	Jas. C. Wilcox	„ 6, 7
Moree P. and A. Society	Indefinitely postponed.	
Nyngan and District P. and A. Association	R. E. Burns	May 13, 14
Upper Manning A. and H. Association (Wingham)	W. Dimond	„ 14, 15
Hawkesbury District A. Association	C. S. Guest	„ 15, 16, 17
Coonamble P. and A. Association	F. C. Lamoth	July 16, 17
Deniliquin P. and A. Society	Louis Harrison	„ 17, 18
Hay P. and A. Association	G. S. Camden	„ 23, 24
Urana P. and A. Society	J. Wise	„ 23, 24
Riverina P. and A. Association	W. Elliott	„ 29, 30
Condobolin P. and A. Association	D. H. Tasker	„ 30, 31
Gunnedah P., A., and H. Association	J. H. King	Postponed.
Balranald P. and A. Society	C. S. Bainbridge	Postponed
Narrandera P. and A. Association	J. T. Williams	Aug. 6, 7
Forbes P., A., and H. Association	N. A. Read	„ 6, 7
Corowa P., A., and H. Society	E. L. Archer	„ 12, 13
Parkes P., A., and H. Association	G. V. Seabron	„ 13, 14
Murrumbidgee P. and A. Association (Wagga Wagga)	R. E. A. Shorter	„ 20, 21
Grenfell P. and A. Association	Geo. Cousins	„ 27, 28
Northern Agricultural Association	C. Poppenhagen	„ 27, 28, 29
Cootamundra A., P., and H. Association	T. Williams	„ 27, 28
Junee P., A., and I. Association	G. W. Scrivoner	Sept. 3, 4
Murrumburrah P., A., and I Association	J. A. Foley	„ 3, 4
Young P. and A. Association	C. H. Ellerman	„ 9, 10
Manildra P. and A. Association (Exhibition and Ploughing Matches)	G. W. Griffith	„ 10
Albury and Border P., A., and H. Association	W. J. Johnson	„ 10, 11
Yass P. and A. Society	W. Thomson	„ 11, 12
Berrigan A. and H. Society	G. Hamilton	„ 17
Germanton P., A., and H. Society	G. T. S. Wilson	„ 17, 18
Burrowa P., A., and H. Association	John N. Clifton	„ 18, 19
Temora A. and P. Society	W. H. Tubman	„ 23, 24
Wentworth P., A., and I. Society	Jas. W. Thorn	Oct. ...

1903.

Ulladulla A. and H. Association (Milton)	C. A. Cork	Feb. 18, 19
Inverell P. and A. Society	T. P. Borthwick	Mar. 18, 19, 20

[15 plates.]

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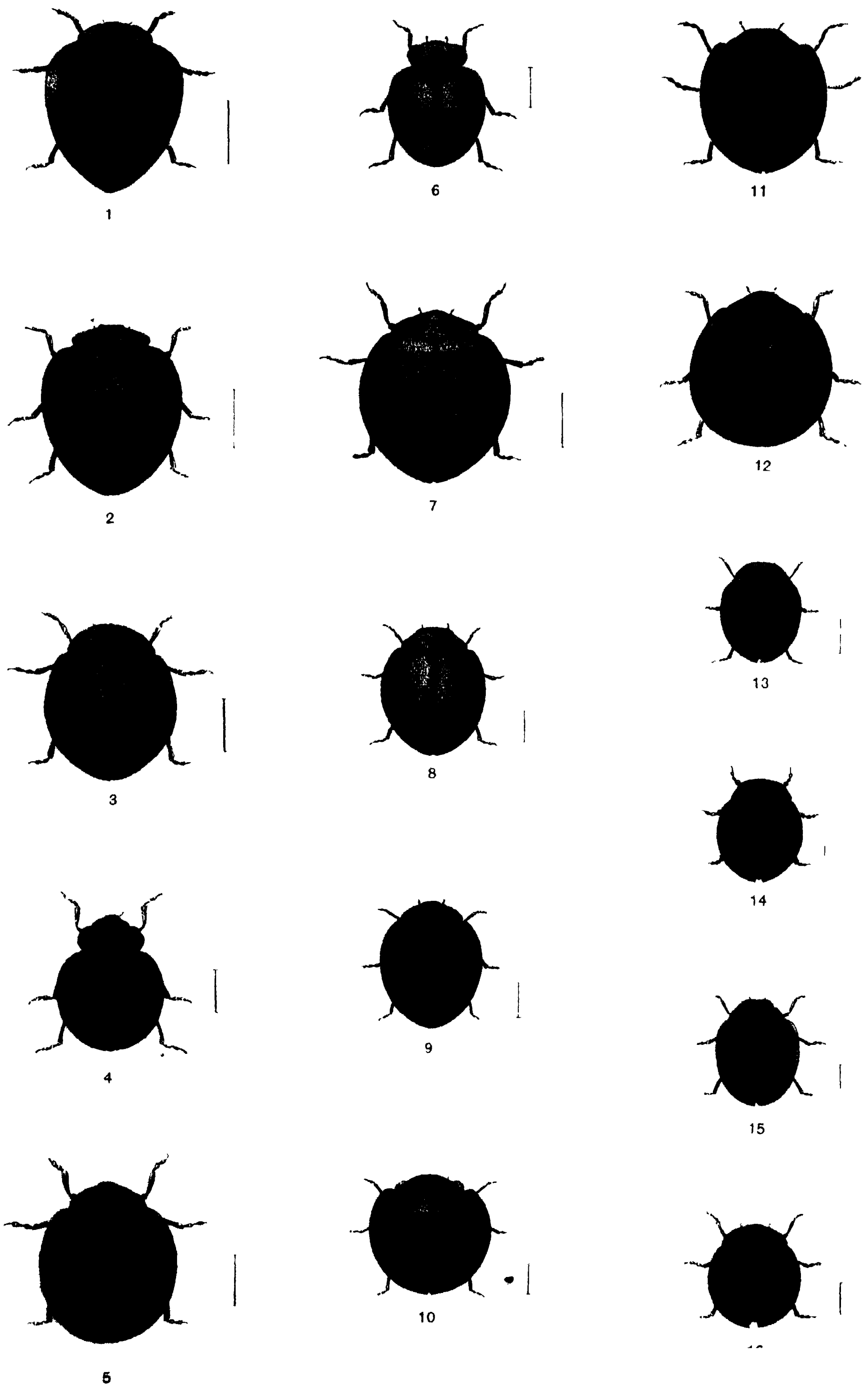

AUSTRALIAN LADYBIRDS.

Australian Ladybird Beetles.

WALTER W. FROGGATT.

During the last ten years a great deal has been written about useful or beneficial insects, and no group has received more universal notice as the orchardist and farmer's friends than these busy little beetles; in "*Insect Life*" there are no less than thirty-eight references to one species alone, *Vedalia cardinalis*.

It is difficult to ascertain when these insects were first recognised as the enemies of other little creatures. Shakespeare mentions many insects in his works, but I can find no reference to "ladybirds"; yet from a very early date they have been loved by the children of many lands, and in France were even treated with a certain amount of reverence by the country folk, who called them "God's cows" (*Vaches à Dieu*) and the "Virgin's beetles" (*Bêtes de la Vierge*).

It would be interesting to trace back to its origin the old nursery rhyme—"Ladybird, ladybird, fly away home"—it certainly goes back some generations. The writer repeated it with the little beetle on his finger-tip, playing with his brothers and sisters in an Australian garden many years ago, where he learnt it from his mother, handed down to her by an old Yorkshire gardener; and our more practical children still keep up the quaint conceit.

Kirby says that Dr. Darwin suggested that they might be used to clear aphis out of greenhouses, and also to protect aphis-infested crops; but they had been known to the English hop-growers some time before. One species, in 1807, covered the shores of Brighton and all the watering places along the south coast, to the great surprise and even alarm of the inhabitants, who were ignorant of the fact that they were emigrants from the neighbouring hop-fields.

In ancient pharmacy they were reckoned as a cure for toothache, and also a remedy for colic and the measles, though how many for a dose is not stated.

The actual modern introduction of ladybirds into other countries to destroy plant-injuring pests reads almost like a fairy tale, and is one of the romances of practical entomology—setting one insect to fight another.

In August, 1888, Mr. Albert Koebele was dispatched to Australia by the United States Department of Agriculture, to look for and report upon any natural parasites he could discover destroying the Cottony Cushion or Fluted Scale (*Icerya Purchasi*), which some years before was introduced probably from New Zealand or Australia, into the citrus orchards of California, where, untrammelled by the many parasites that infest it in this country, it had increased into such multitudes that they threatened to make orange-growing in California a thing of the

past. The marvellous success that attended Koebele's mission is related in the notes upon *Novius cardinalis,* which he collected and sent to the orchards where they increased more rapidly than the scales.

The interest excited in all quarters by the introduction of ladybird beetles into America led to several other expeditions to Australia, and quite a boom set in for the interchange of specimens. The Australian entomologists had quite a run on their species; the tea-planters and coffee-planters of Ceylon and India asked for them to destroy mealy bug and scale; from the Cape of Good Hope came requests for others; and Egypt and Portugal, in turn having introduced Fluted Scale into their gardens and orchards, applied for ladybirds to check it. Later results, in many instances, have not been as successful as in the first instance, frequently through the mistaken idea that any kind of ladybird would feed upon any kind of scale; when, as a matter of fact, each species of Coccinella has a marked partiality for some particular group of aphis or scale insects; so that it is quite useless sending a species that feeds upon aphis or mealy bug to destroy a hard *Aspidiotus* scale.

The Australian insect fauna is very rich in representatives of the leading groups of the great family *Coccinellidae* (ladybirds), which in their native hunting grounds keep in check multitudes of scales that infest our indigenous plant life; and though we have quite a number of the large soft-bodied coccids, commonly known as "mealy bugs," peculiar to Australia, they cause little or no damage to either cultivated or native vegetation, owing to the attacks of the ladybirds and other parasites. Now in nearly every other agricultural country native mealy bugs are more or less destructive, but when a strange species arrives with some introduced plant and successfully brings forth her immense brood, protected under her body, unimpeded by the natural enemy that has been left at home, it soon becomes a fearful pest, particularly in a country where native ladybirds are scarce.

Yet, in spite of our many friends both in the bush and orchards, there is no perceptible check upon several of our worst orchard pests, such as Red Scale (*Aspidiotus aurantii*), or San José (*Aspidiotus perniciosus*), and even the Mussel Scale of the apple (*Mytilaspis pomorum*) and Woolly Aphis (*Schizoneura lanigera*) which still keep their hold in infested districts.

The ladybirds hold their own place in the scale of nature, are valuable allies to the agriculturist, and should be protected and preserved in every way; but they cannot do impossibilities, and no words are used more often than "exterminate" or "eradicate" in a wrong sense when applied to the destruction of insect pests. We can with care keep out new insect pests by a strict system of quarantine, but when once a pest has become established we cannot eradicate it, we can only check it so far that it becomes harmless, and if we once stop the fight it soon asserts itself again, and this particularly applies to all such minute creatures as scale insects. Even where ladybirds are plentiful, and appear to have eaten up all the surrounding scale, the hidden larvæ that have escaped appear in the following summer, and if they get a fair start before the ladybirds appear will soon overrun the plant. It stands to reason that if all the coccids were devoured

this season there would be no food next year, and the beetles would have to move on or starve. It is not that the ladybirds have not been, and will always remain, useful, but we have been over sanguine, and expected too much from them without understanding how altered conditions of climate and surroundings affect them ; so that even with the ladybirds we shall have to spray or fumigate, at any rate for such scales as Red Scale and San José.

Lounsbury has recently published some observations on this aspect of the case, based on his visit to the United States, where he found the evidence of the value of particular species very conflicting.

Classification.

Family Coccinellidae.

The family name is derived from the diminutive of the Latinized Greek word *Kokkos*, a seed or berry, given to the beetles on account of their general rounded or convex shape ; but other authorities give the Latin *Coccinus*, scarlet colour, as the root of the name.

Over 2,000 species are described from all parts of the world, comprised in some 140 genera, many species of which have an extended range, while others are comparatively local. Lea gives a list (including a number of new species described) of 110 species from Australia. The members of this family, with the exception of one large group, are all carnivorous, both in the larvæ and adult state, but, on account of their outward resemblance, are sometimes mistaken for chrysomalid beetles, which are all plant-eaters. They differ chiefly in the structure of the tarsi (feet), having only three joints, with short antennæ composed of eleven joints (rarely 8-10), the last forming a club.

Genus I.—*Epilachna*, Chevrolat, 1844.

The members of this genus are remarkable from the fact that they differ from all the other groups of this family by feeding upon the foliage of plants, whereas all the others are carnivorous, and of great service in checking scale and aphis.

Over 200 species have been described, chiefly confined to Central and the northern portion of South America, Africa, India, Ceylon, through the Malay Archipelago, New Guinea, New Caledonia, and Australia. Four species are recorded from Australia, two of which are well-known pests which have a particular liking for the foliage of solanaceous plants, such as potatoes, tomatoes, &c.

The 28-spot Ladybird (Epilachna 28-punctata, *Fab.*). (Fig. 2.)
[Fabricius, *Syst. Ent.* 34, 54, 1775]

This ladybird beetle is one of the two representatives that we have of this plant-eating group, but it has a very extended range, being found in India, China, Japan, Manilla, a number of the Malay Islands, New Guinea, and Australia. Crotch says : "This species varies almost to infinity, and gradually runs into the common 6-spotted type, so that I cannot give any structural differences." Mulsant gives a number of these variable forms names; and Crotch says that his *E. implicata* is also a variety.

The beetle measures about one-third of an inch in length, is ovate in form, with the general colour orange-yellow (fading to an orange-brown when dead); the whole insect finely clothed with a brownish pubescence, which gives it a satiny sheen. The head is brown, hidden from above, the thorax dull yellow on the outer margins, blotched with black in the centre; the wing-covers banded with four transverse rows of large irregularly round black spots, the first of four, the second of eight, the third and fourth of six, and the last of two at the tip of the wing covers. Upon the under surface the eyes, thighs, thoracic, and centre of abdominal segments black.

The pale yellow eggs are attached by their thickest end in little clusters to the foliage of the food plant, and the larvæ is a very curious yellow creature covered with brown blotches, from which spring curious spined tubercles, which form transverse rows across the segments; these spines are black, and give the creature a very curious appearance. The larvæ measure about half an inch in length when full-grown, and in pupating are gregarious in their habits, the leaves of the food plant sometimes being covered with scores of the attached pupæ clustered together on the under surface of the leaf. They are a well-known pest on potatoes, gnawing the surface of the foliage, and also attack all allied plants of the Solanaceæ. The different species of nightshades are attacked by them, and along the beach at Botany I have found the "trumpet flower" (*Datura stramonium*) covered with the beetles and larvæ.

In the first vol., 1890, of this Gazette, Olliff gives a detailed description of this beetle, with its life-history, illustrated with wood-cuts, under the title of "Insect Pests: A Leaf-eating Ladybird."

In his Report upon Insect and Fungus Pests, Tryon describes the damage that this beetle does in the southern portions of Queensland, under the name of the 33-spotted ladybird (*Epilachna multipunctata*).

The Potato-leaf Ladybird (Epilachna guttato-pustulata, *Fab.*).
(Fig. 1.)

[Fabricius, *Syst. Ent.* p. 87, 1775.]

This beetle, which attacks the foliage of the potato in Southern Queensland and the northern parts of this State, has a wide distribution from Cape York, Queensland, to Tasmania, but the southern form differs somewhat in colouration from the typical species, and is seldom found in the neighbourhood of Sydney.

Our typical form varies somewhat in size, but measures up to one-third of an inch in length, with the head small, palpi and jaws very prominent, the thorax contracted at the margins, with the body ovate or somewhat pear-shaped; the head is reddish-brown, when at rest turned down under the thorax, eyes black; the thorax black in the centre, flattened, light-yellow on the sides; the wing-covers with four large blotches of rich orange-red forming a double row on the back, one on either side of the median suture, which only slightly separates the front pair; two light-yellow blotches on either side running to the outer edge of the elytra in a line with the reddish-orange blotches, in the upper pair separated, but in the hind pair in contact with the

richer colour; the rest of the dorsal surface black, the whole clothed with short brownish hairs; the under surface of thorax, centre of abdomen, and legs black.

This beetle is a well-known pest in Southern Queensland and the northern parts of this State, where it damages the potato crops by devouring their foliage.

Olliff has figured and noticed this species in his paper on "Insect Friends and Foes," in the second vol., 1891, of this Gazette. Tryon (Report on Insect and Fungus Pests, 1889) gives a detailed description of this beetle and its life-history, as one of the pests of potatoes, under the name of the "8-spotted Ladybird."

GENUS *Coccinella*, Linnæus, 1735.

This is the original group of this family, founded by Linnæus, and though many species first described under this genus have since been placed in fresh groups, and it has otherwise been cut up and subdivided, Crotch lists 45 species in this genus, which is world-wide in its range. They are all yellow or reddish-yellow tinted beetles, marked with black or brown. Five species are recorded from Australia.

The Small Aphis Ladybird (Coccinella repanda, *Thunb.*). (Fig. 4.)

[Thunberg, *Novæ Species Insectorum*, I, p. 18, f. 25, 1781.]

This beetle measures one-fifth of an inch in length, broad and rounded, of the typical ladybird form; the head black, with the face marked with yellow, and the thorax of a similar colour blotched on either side, and in front with yellow; wing-covers deep orange-red, with the front margin behind the head tinged with pale yellow; a stout dorsal stripe forms a rounded spot just behind the thorax, and another at the apex, but tapers out at the extreme tip black, with the elytra on either side ornamented with two irregular black blotches, the first of an irregular V shape, the second an irregular more rounded blotch, and towards the apical edge a small spot; the under-surface black, with the exception of the red margins of the wing-covers, and two white spots on either side of the abdominal segments above the legs. In dead specimens the rich tints fade into a dull yellow. This is our typical form, but it is very variable in the markings on thorax and elytra; instead of the front V-shaped mark there is a more swollen elongate blotch, with a rounded spot on either side just behind, and instead of the small apical spot merging into the lower margin of the wing-cover there is a large round blotch, and the central dorsal stripe is more elongate. This little beetle may be found all the year round about Sydney, but is most plentiful in the early summer, when it is found feeding upon the rose and peach aphis, but, though chiefly an aphis-feeder, I have found it on trees infested with San José scale (*Aspidiotus pernicosus*) at Gosford devouring the larvæ of this scale.

This species has a wide range, from China and India, through the Malay Archipelago, Australia, Tasmania, and New Caledonia.

On account of its variable markings it has since been described under a number of different names by writers on this family.

The Variable Ladybird (Coccinella arcuata, *Fab.*). (Fig. 3.)
[Fabricius, *Mantissa Spec.* I., 55, 21, 1787.]

This is a larger species, measuring up to 3½ lines in length; general colour of the upper surface rich orange-yellow; eyes black; the thorax generally marked with two black spots in the centre, sometimes running into a large blotch; the dorsal stripe on the wing-covers very narrow, coming to a lance-shaped mark at the apex, with three distinct transverse rows of black spots or blotches, the first consisting of four small ones, the second of four much larger, and the third of a larger one still on either side; the tips of the wing-covers more or less marked with black; the under surface is yellow, except the thorax basal portion of the legs and centre of abdominal segments, which are black.

It is an extremely variable species, with the black markings sometimes very slight, and in others all running into each other. Crotch says:—"A very variable species, the sub-apical band is the last thing to disappear, sometimes it is an entirely unicolourous reddish ochreous."

It has a wide range from China, Phillipines, Singapore, Java, New Caledonia, and Cape of Good Hope. It is found at Cape York, and has a wide range over Australia, and is found about Sydney, but not as common as the former species. It also is an aphis-feeding species.

GENUS *Callineda*, Crotch.

This group is only represented by five species, and is confined to the Malay Archipelago and Australia. Crotch says:—"This genus is chiefly characterised by the antennæ, which are rather short, with a three-jointed club, the last joint being very large and set on obliquely, so as to appear securiform.

The Tortoise Ladybird (Callineda testudinaria, *Muls.*). (Fig. 7.)
[Mulsant, *Coleop. Trimeres*, p. 300, 1850.]

This beetle measures slightly under a quarter of an inch in length, and is broadly rounded in proportion; its ground colour is a light, shining, ochreous yellow, the hind margin of the thorax is finely margined with black, from which an irregular parallel horn or bar of black projects on either side towards the eyes, but not reaching to the front margin; the wing-covers have the outer edges and dorsal stripe down the centre pencilled with black, which also crosses from the edges, forming a well-defined cross in the centre of each elytra. In extreme cases the black lines or blotches quite divide the wings in four irregular squares on either side, while on the other extreme the black markings on either side are only represented by a single line running out from the front margin; under surface of the thoracic segments black, legs brown. This species is plentiful in Southern Queensland and the northern rivers of this State upon the low bush and scrub. I have never taken it about Sydney or the western country, but I believe it is recorded from the former. Lea says:—"Coastal districts of New South Wales."

GENUS *Verania*, Mulsant, 1850.

The type of this genus is Thunberg's *Coccinella comma*, from Natal, Caffaria, and Java. Crotch defines it as follows:—"This genus is more oval than *micraspis*, with the margins of the elytra not produced, but rather reflexed, but I cannot see that it was necessary to separate it." Thirteen species are given in his list, five from Australia, one of which however, is doubtful, three from Africa, and the rest from India and the Malay Archipelago.

The Slender-striped Ladybird (Verania lineola, *Fab.*). (Fig. 8.)
[Fabricius, *Syst. Ent.*, p. 79, 5, 1775.]

This beetle is described from Australia, with no more definite locality, by Messrs. Mulsant & Crotch, but it is not uncommon on the Northern rivers and Southern Queensland, where it can be taken feeding upon aphis on the low shrubs.

The beetle measures two lines, and is of a uniform pale yellow colour with the eyes, two little spots in the centre, and an irregular blotch behind on the hind margin of the thorax black; the wing covers finely pencilled with black down the median suture, and round the outer edges, with a parallel thickened curved stripe down the centre of each wing cover, but not extending to the outer edges on either extremity.

Crotch says: "A variety with the vitta interrupted is rarer; it differs from *V. lineata* by the more obsolete punctuation, and by the vitta being truncate at the base."

I have what is probably a variety of this species collected at Port Darwin, N.T., and King's Sound, on the North-west Coast, that differs in having the black line in the centre of the elytra only represented by two short interrupted black lines, and the black markings on the thorax wanting.

This ladybird beetle is not plentiful enough to do much in destroying injurious pests, but might under altered conditions increase in numbers like other species have done.

The Striped Ladybird (Verania frenata, *Erich.*). (Fig. 9.)
[Erichson, *Archives f. Nat.* VIII, 239, 1843.]

This specimen is about the same size as *V. lineola*, but differs in colouration in having the base of the thorax thickly and deeply marked with black; the central stripe along the suture of the elytra slender in front, but thickening into a much broader bar in the centre; the lateral stripes on either side more irregular, thickened, arcuate at the base, clubbed at the apex. This beetle is recorded from some of the Malayan Islands, Queensland to Tasmania, and also in New Caledonia. It is not common about Sydney. Most of our specimens come from the Northern Rivers, where it can be found on the low shrubs in the scrubs.

This is one of the aphis-eating ladybirds, and is not of much use, even if it were plentiful, as a scale destroyer. Thompson states that he has found it in Tasmania feeding upon woolly aphis (*Schizoneura lanigera*).

GENUS *Leis*, Mulsant, 1850.

This genus was formed by Mulsant to contain a division of the Coccinella having the abdominal plate terminal, or nearly so.

Thirteen species are described from India-Malay region and a single species from Australia. Until recently this was known under the name of Coccinella conformis.

The Spotted Ladybird (Leis conformis, *Boisd.*). (Fig. 5.)
[Boisduval, *Voyage de l'Astrolabe*, p. 604, 1835.]

One of the largest and commonest species in our orchards and gardens, measuring 3½ lines in length, of a uniform bright orange-yellow thickly spotted with black, forming four marks on the thorax and four transverse rows across the wing covers, the first and third containing five, the second six, and the last two spots. Upon the under surface the head, thighs, and thoracic and abdominal segments marked with black. This beetle has a wide range all over Australia from Queensland to Swan River, and is also plentiful in Tasmania. It is one of the most active aphis-eating species common in our gardens, where it destroys the rose and cabbage aphis, and in the orchards feeds upon the orange aphis. It is sometimes found on trees infested with red scale and "white louse," where it probably devours the young larvæ, but it does not, as far as my observations go, ever attack adult scale, though in captivity it will greedily devour the eggs and larvæ of olive scale (*Lecanium oleæ*), if the adult scales are turned over so that it can get at them, though it seems to have no idea how to open them for itself even when hungry.

Their chief value in the orchard is as destroyers of "Woolly Aphis" or "American Blight" (*Schizoneura lanigera*). In the early summer of this last season the elongated smoky-tinted larvæ were crawling all over the trunk and branches of a badly infested apple orchard under observation at Mittagong; later on in the season all the aphis had completely disappeared, and while bandaging the trees for codlin moth I counted upwards of 400 adult ladybirds clustering on the shady side of the tree trunks during the heat of the day.

On several occasions this species has been sent to America, but I can find no record of it having become established in that country.

During the year this beetle has been introduced in England, where Theobald hopes to use it against the hop louse.

GENUS *Thea*, Mulsant.

Ten species are included in Crotch's Catalogue, some having a wide range over Europe, others in Asia, and one from Austràlia.

Crotch doubts whether this is a valid genus. He says: "It is only based on the slightly deeper emargination of the thorax in front." As he uses it in his list, I keep the name, though Lea places all our Australian species in the Genus *Halyzia*.

The Bicoloured Ladybird (Thea galbula, *Muls.*). (Fig. 6.)

[Mulsant, *Coléoptères Trimeres*, p. 166, 1850.]

This beetle measures under 2 lines in length, with the general colour of the upper surface bright canary yellow, the centre of hind portion of the thorax deeply blotched with black, which merges into another patch of the same colour extending to both of the wing covers on the front margin; the median suture, barred with black, connects this with a large irregular band across the back, and runs down into a patch of the same colour at the extreme tip of the wing covers. The under surface and legs black. The head is contracted under the thorax when at rest, and the latter is somewhat flattened and delicate in structure. Some ten years ago the handsome, brightly-marked ladybird beetle appeared in considerable numbers in our orchards and gardens about Sydney, feeding upon aphis; before that, if present, it was rare or unnoticed. I have collected specimens about the Richmond and Tweed Rivers, but it was not plentiful in those districts.

GENUS *Orcus*, Mulsant.

The members of this genus, or, at any rate, the typical forms, according to Crotch appear to be confined to the Malay Islands and Australia; he lists five Australian species, and one from Java and Art respectively. Lea adds two other new species. They are all bright metallic-coloured beetles, sometimes marked with orange spots or blotches, and have very curious larvæ covered with spiny slender tubercles.

The Steely Blue Ladybird (Orcus chalybeus, *Boisd.*). (Fig. 10.)

[Boisduval, *Voyage de l'Astrolabe*, p. 593, 1835.]

This beautiful little ladybird beetle is of a uniform brilliant metallic steel-blue colour, measuring about one-eighth of an inch in length. It is the commonest species of this group in our citrus orchards, where, especially in neglected ones, by shaking over a sheet, one can soon collect a few hundred anywhere near Sydney in the early part of summer. The male differs slightly from the female in having the sides of the thorax light yellow, which in dead specimens shades into white, and they also sometimes curve upwards slightly. The larva has the typical dark colour, short, stout form clothed with curious hairy spines; it feeds upon the larval red scale (*Aspidiotus aurantii*) and "white louse" (*Chionaspis citricola*), but in its native state destroys many indigenous species. I consider this one of our most useful scale-devouring species, as it attacks so many scales, and is also very common. A considerable number have been sent away from Australia to other countries. I have sent them to Tasmania, New Zealand, India, and Ceylon, but away from their native surroundings they do not appear to thrive or increase in numbers. Messrs. Coquillet and Koebele, reporting upon the species that had been introduced in California from Australia and placed in the orchards in the summer 1892, in one place found that where 540 specimens had been liberated it was hard to find 100 two years later. Coquillet said that those placed on plants infested with red scale had done well, but others among olive scale (*Lecanium oleæ*) had all died out or gone away.

The Six-spotted Ladybird (Orcus Australasiæ, *Boisd.*). (Fig. 11.)
[Boisduval, *Voyage de l'Astrolabe*, p. 593, 1835.]

This is a larger species than the last, with the blue colour somewhat duller and darker, the front portion of the wing covers marked with a transverse band of four rich orange spots, two on either side, the lateral ones largest and more irregular in form than the dorsal pair; on the hind margin is another similar shaped spot on either side.

It is recorded from Queensland, New South Wales, Victoria, and Tasmania. Olliff briefly notices, but figures it in various stages of development in "Insect Friends and Foes," *Agricultural Gazette*, N. S. W., 1891. Tryon has recorded it as an enemy of the introduced scale (*Mytilaspis Gloveri*) in the Toowoomba district, Queensland. In this State it is much rarer than the former species, but is met with in the citrus orchards feeding upon the same scale, and I have also found it feeding upon "woolly aphis" at Mittagong.

A species has been described under the name of *Orcus nummularis* by Boisduval, which Crotch records as a variety. He says: "*O. nummularis* is a rare variety, in which the posterior spot is divided." I have a variety in which all three spots are united. Our common species seems to be of this variety, for Mulsant's description gives only three orange spots in the first row, the central one divided by the elytra, and four distinct ones in *O. nummularis*.

The Two-spotted Ladybird (Orcus bilunulatus, *Boisd.*). (Fig. 12.)
[Boisduval, *Voyage de l'Astrolabe*, p. 594, 1835.]

This is our largest species of a dark blue-black colour, with a large irregular orange blotch of orange-yellow on either side of the elytra behind the thorax. Crotch says: "Form subovate, rather opaque, very obsoletely punctate, elytra not thickened at the margin, thorax with the sides uniformly punctate." He records it from North Australia; it has, however, a wide range over this State. I have specimens from the Northern rivers, Tamworth, and Mittagong, and near Maitland I once collected a number feeding upon a sheoak-tree scale (*Rhizococus turgipes*, Mask). Tryon says it feeds upon Glover's scale (*Mytilaspis Gloveri*) in Queensland; but I have never taken it in orchards about Sydney.

GENUS *Novius*, Mulsant, 1850.

This genus was formed for the type *N. cruentatus*, a species found in France, and another species, *N. sanguineolentus*, from Australia. Mulsant had created a new genus, *Vedalia*, for the reception of *V. Sieboldii* from Mexico, and *V. cardinalis* from Australia, both genera still hold good, but our species has been removed to the former group. Olliff named, but never described, a species under the name of *Novius Koebelei*; Blackburn another species under the name of *Novius bellus*, with a wide range over New South Wales, South Australia, and Western Australia, and another, *N. Lindi*, from Western Australia. Lea has published descriptions of two new species.

The Icerya Ladybird (Novius cardinalis, *Muls.*) (Fig. 15.)
[Mulsant, *Spic. Coléop*, p. 906, 1850.]

The type of this species was described by Mulsant from a specimen in the Hope collection in the British Museum from New Holland, under the name of *Vedalia cardinalis*. When the fluted, cottony cushion scale *Icerya Purchasi* was introduced into California, and spread with such alarming rapidity that it threatened to destroy all the citrus trees in the country, collectors were despatched by the United States Department of Agriculture to visit New Zealand and Australia, from whence this mealy bug was supposed to have come, to see if any parasites could be found that would help to keep it in check. The choice fell upon one of our most remarkable latter-day practical entomologists, Albert Koebele, who rediscovered the pretty little ladybird beetle, only, I believe, in small numbers in New South Wales, but very plentiful in New Zealand. At this time it was unknown according to Olliff. He wrote to Mr. Allen Wright in New Zealand in 1890, asking him for specimens, and stating he had never seen the beetle; it was in no Australian collection, and the only one he knew was in the British Museum collections. In some notes recently received from Mr. A. M. Lea, Government Entomologist, Tasmania, it appears that Olliff was mistaken. "There is a specimen of this species in the Sydney Museum taken by Mr. Geo. Masters at King George's Sound, Western Australia, in 1864. I have taken it in all the States, and the only occasion when I have seen it feeding upon anything but *Icerya* was quite recently at Wollongong, when I saw a few specimens feeding upon a species of *Dactylopius* in company with *C. montrouzieri*. Lea was the first collector to find this ladybird near Sydney; Olliff recording its discovery in the Transactions of the Linnean Society, New South Wales, in 1891.

This beetle is now plentiful on the Tweed and Richmond Rivers, and not uncommon about Gosford and Sydney when carefully looked for. From its introduction into so many parts of the world it is now quite cosmopolitan in its distribution.

The first importation of this beetle into California was in November, 1888, when 129 specimens were landed alive. In the following year, between January and June, 10,555 specimens were distributed to orchardists in California.

In 1889 *Icerya Purchasi* was discovered in Honolulu, when a consignment of this ladybird was collected in Los Angeles, California, and sent to that country in 1890, and a year later the mealy bug, as a pest, had vanished.

In 1892 this ladybird was introduced to South Africa, where the mealy bug had done an immense amount of damage, and in the same year another consignment was shipped from California to fight the allied mealy bug (*Icerya aegypticum*). The last place to which this beetle has been successfully sent is Portugal, where the *Icerya* had made its appearance: so that one might say that we have a ladybird beetle chasing a mealy bug round the world.

The beetle measures slightly over one-eighth of an inch in length, and is somewhat variable in size, some being very much smaller. The head, central portion of the thorax, a broad stripe down the centre of the wing covers swelling out on the centre, four large spots on the wing covers, and a curved c-like mark on the hind margin black, the rest of the dorsal surface bright red. The black markings are, however, very variable; in a large series one will find specimens without any black markings on the wing covers; others with only the median stripe down the back and a spot on either side; while in others, again, there is more black than red. The larva is dark orange-red, covered with transverse rows of dark brown warts surmounted with white bristles, and, when adult, covered with a greyish powder. The pupa is like that of many others, protected by the cast larval skin.

This ladybird is strictly a parasite upon mealy bugs, and, with the exception of Lea's observation, I have never known of it attacking anything else but this particular mealy bug, *Icerya Purchasi.*

GENUS *Rhizobius*, Stephens, 1832.

Though this group was founded upon a European species, Australia appears to be their stronghold, as in Crotch's list eight species are recorded from Australia and only three others from Africa and Europe, and since then sixteen more have been described by Messrs. Blackburn and Lea. They are all medium-sized black beetles, finely punctured, and lightly clothed with fine pubescence; antennæ long.

The Eriococcus Ladybird (Rhizobius ventralis, *Erich.*). (Fig. 16.)

[Erichson, *Archives f. Nat.*, Vol. VIII, p. 239, 1842.]

This beetle measures slightly under 2 lines in length; its general colour is black, the upper surface finely punctured, but shining and clothed with fine pubescence, thickest on the outer edges of the thorax and elytron; the legs and under surface of head ferruginous, with the abdominal plates reddish yellow.

In its native state I have found the beetles and larvæ very destructive to *Eriococcus coriaceous* and *E. paradoxus*, both of which scales are so thick upon the branchlets of many species of young eucalypts that if it were not for the presence of this ladybird beetle in the early part of the season many trees would probably be killed. All through the summer the beetles can be found, and towards the end of it the larvæ can be taken pupating in the dead curled bits of bark on the branches and trunks. The larva is a dark brown creature of the usual flattened form. I have collected a thousand in a morning, in the neighbourhood of Mittagong, upon young gum-trees, by pulling off the loose bark and packing it in tins.

This species has a wide range in Australia, but was originally described from Tasmania. It will soon be cosmopolitan in its range, as it was one of the first species introduced into California, where it has now established itself, as a very useful friend in destroying various *Lecanium* scales.

I have sent a considerable number over to the Secretary of the Tea-planters' Association of Southern India, but have had no record as yet of them becoming established in that country. Others have been despatched to Ceylon; but the results there have been disappointing, for the Government Entomologist (Mr. E. E. Green), writing from Perydenia, says that the climate does not suit them, as they wander about and do not seem to take to the common *Lecanium*.

This has not been the experience in California, judging from Koebele's account ("Insect Life," Vol. VI, p. 24), as he states that in the orchards at Santa Barbara, where this species had been liberated after his first trip to Australia, they had increased to millions, and he says: "I believe that the various *Lecania* in California (and Florida as well) will have succumbed to the ferocity of this little beetle."

Later on Craw was able to secure 500 colonies, comprising 10,000 specimens, and a year later reported that he again visited the orchard and found the black scale cleared, though the original importation had only been fifty specimens three years before. They have also been sent to Tasmania and New Zealand, and should thrive in those climates.

The Auracaria Scale Ladybird (Cryptolæmus montrouzieri, *Muls.*). (Fig. 13.)

[Mulsant, *Coleop. Trimères*, Supp., p. 140, 1853.]

This beetle is very variable in size, measuring from under 2 to 3 lines in length, with the head, thorax, extreme tip of both wing covers light orange yellow; the whole of the under surface reddish-brown, and both the upper and under surface clothed with fine hairs. In a number of specimens the undersurface is variable in colouration, the middle and hind pairs of legs with the thorax dark reddish-brown to black.

The larva is of the usual smoky-brown tint, but so thickly clothed on the upper surface with white filaments that it appears to be of a uniform white, the pupa hidden beneath the larval skin and the immature beetle are pale yellow.

This is the type of the genus, and was named by Mulsant after Abbe Montrouzier, a missionary of the Marist Brothers, who wrote a work on the Insect Fauna of Woodlark Island. He gives the locality as Australia, but Crotch records it from Moreton Bay, Queensland; but it is now known to have an extended range over the Queensland coast, New South Wales, and probably into the more southern States. Koebele says he has met with it in tropical Australia, Fiji, New Caledonia, Ceylon, and Southern China; and it has been also introduced into several other countries, where it thrives. It is a true mealy bug enemy, feeding chiefly upon a number of *Dactylopius*. The Bunya Bunya and the Norfolk Island Pines (*Auracaria excelsa* and *A. Cunninghami*) that are planted in the streets, avenues, and gardens about Sydney are greatly infested with a large mealy bug (*Dactylopius aurilanatus*), described originally by Maskell from New Zealand, when he suggests that it probably, in the first instance, came from Queensland, the home of the Bunya Bunya.

This coccus smothers the under surface of the fronds with its white yellow-lined cottony sacs, and, where unchecked, caused them to turn yellow, and sometimes drop off, but, fortunately, the plump little coccus is the favourite food of a number of parasites, chief of which is this active little ladybird beetle, particularly in the larval state, when it devours both scales, eggs, and larvæ of the coccus, covering its back with the white flocculent substance that clothed its victims. When it becomes full grown the bettle crawls down from the fronds to the trunk of the tree, where it pupates, covered with the whitened larval skin attached to the loose rough bark.

This last summer, at Manly, they swarmed over the Auracarias growing along the beach in such numbers that the trunks were spotted all over, and they were tumbling on the sand, and crawling over the seats beneath the trees. In the middle of last October I saw a large Bunya Bunya growing in the main street of Maryborough, Queensland, so thickly covered with pupæ and larvæ of this ladybird that it looked as if it had been white-washed down one side, and must have sheltered tens of thousands.

Though, in the first instance, this is a valuable protective covering to the beetles against other insects and birds, it has its drawbacks when they come into contact with man, for I have frequently heard of gardeners spending their time scrubbing them off the infested trees, under the impression that they were real mealy bugs. They certainly look like several species of mealy bug at this stage (the most useful) of their existence; but if one watches their active habits, or turns them over on their backs, he will soon see that they have three pair of stout legs and a biting mouth, very different in structure to the sluggish mealy bug.

In the bush this beetle feeds upon several species of indigenous scale insects, especially *Eriococcus coriaceous*, which infests the branchlets of young gum-trees (Eucalyptus) with white egg-like sacs; but it is not common in our orchards, though odd ones are frequently found, in company with the steely-blue ladybird, in orange-trees infested with white louse (*Chionaspis citricola*).

On account of its value as a destroyer of all soft-bodied scales, it is looked upon by our foreign correspondents as one of our most valuable species, and nearly all of them, when wanting exchanges, ask for this species. Specimens were first sent to the United States by Koebele, from Sydney, in 1891 with several other useful ladybirds, and some years afterwards introduced into Hawaii to destroy the pests on the coffee plant.

There is a note in the *Queensland Agricultural Gazette*, 1897, p. 337, by the editor, stating that Tryon issued a paper in their Department some years before, calling attention to its value as a pest destroyer, but I have not seen the original; but the following extract from Koebele's report, 1897, shows how valuable it has proved in Hawaii Speaking of the most destructive mealy bug known in the coffee plantation, *Dactylopius vastator*, he says: "Without doubt, their destructive work would have spread over all the Islands, notwithstand-

ing the most diligent prevention on your part. The scale has not been met with as yet in any other of the Islands, and at present, wherever it may appear, its enemies are awaiting it, chief of which, no doubt, is the Australian ladybird, *Cryptolæmus montrouzieri*, Mulsant."

"Another numerous scale, and one that has been longer introduced than the previous species, *Dactylopius ceriferus*, Newst., had always been seen covering the leguminous trees, often to such an extent that many of them lost their entire leaves, and in some instances even were entirely destroyed by the quantity of mealy bugs present. This species also is kept on check by the *Cryptolæmus* beetles, which increase to such an extent in the early summer that millions of their larvæ can frequently be seen crawling around where the coccids abound. Often this very beneficial insect, for it is always in the larval state when they do most execution, are taken for so-called blights, and are, in consequence, destroyed. It should always be borne in mind that the scale insects or blights are generally stationary, *i.e.*, fixed to the branches and twigs of plants, very rarely move about, and then only very slowly; the *Cryptolæmus* larva, on the contrary, is quite active, and when full grown is about a quarter of an inch in length, covered above with six rows of contiguous, elongated, white, mealy, secreted, appendages. It is then that they can be seen in such numbers that often the fences and walls are covered, and trunks and limbs of trees bear patches of the pupæ, often several feet in length."

GENUS *Scymnus*, Kugelann, 1794.

This genus was formed by Kugelann in Schneider's Magazine, Vol. IV. 1794, when six species were included. Crotch catalogues 171 species, and a considerable number have since been described—all the Australian species (23)—quite recently by Messrs. Blackburn and Lea. This group contains a number of the smallest species of the family, and is almost universal in its distribution, species being recorded from Siberia to Peru.

Distinctive characters: Antennæ very short, joints 1-2 equal-sized, soldered together; black, clothed with fine down or hairs.

The Mite-eating Ladybird (Scymnus vagans, *Blackb.*).

[Blackburn.]

This is a tiny little creature scarcely half a line in length, and when on the foliage looks like a little black spot. The general colour is black, shining, and thickly clothed with fine grey hairs; on the under surface the legs are smoky brown. It is common in the Botanic Gardens in Sydney, where upon the foliage of an arum I have taken numbers, which were found on examination with a pocket lens to be feeding upon a small red mite infesting the midrib of the leaf.

Messrs. Tryon and Lea state that it feeds on "Red Spider" (*Tetranychus telarius*); the latter records it from Tasmania and Western Australia.

The Red-backed Ladybird (Scymnus notescens, *Blackb.*). (Fig. 14.)
[Blackburn.]

This, a very active little beetle running about all over the foliage of scale-infested plants, is common upon wattle-trees and gum-trees in the bush, where it feeds upon the larvæ of a number of scale insects. In the orchards it is found upon citrus-trees infested with white louse (*Chionaspis citricola*), but never in great numbers like some species.

It measures slightly over a line ($\frac{1}{12}$ inch) in length, of a general shining black colour, with a large transverse blotch on either side occupying the centre of each elytra on either side of a rich reddish-orange colour, which after death fades to dull yellow; the upper surface clothed with fine short grey hairs.

Lea says it is found in New South Wales, South Australia, Western Australia, and Tasmania.

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Giving an account of this beetle and its habits, and how it has cleared off the mealy bug in many districts.

"Horse-breeding in England and India, and Army Horses Abroad": by Sir Walter Gilbey, Bart.

ALEX. BRUCE,
Chief Inspector of Stock.

THIS is one of a series of interesting and instructive booklets which Sir Walter Gilbey has written on the history and characteristics of the different breeds of the horses of the United Kingdom.

Like all Sir Walter's works on the subject, this, which is his latest, is full of valuable practical information, which he brings to bear upon the portion of the subject with which he is dealing in a clear and effective manner.

He is himself an acknowledged judge, and a very successful breeder of several classes of horses, but more particularly of saddle, light-harness, and carriage horses, and any opinion he gives may be relied upon.

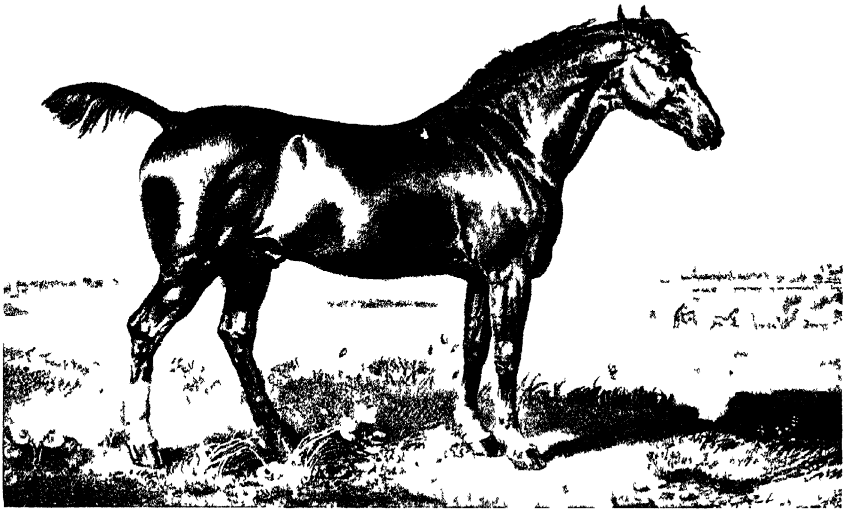
The receipt of this work of Sir Walter's at this time is very opportune, for the question which our horse-breeders will now have to consider will be how our saddle and light-harness horses can be bred at a profit, and adapted either for private or military purposes; and this is what he discusses in this booklet, and states clearly what his views are so far as English horses are concerned.

Not only so, but to show that they are well-founded, he supplies a large amount of valuable information with respect to what is being done on the Continent of Europe in horse-breeding, and the encouragement given to breeders by the different Governments.

In fact, Sir Walter has gone thoroughly into the subject, and whether or not our breeders feel inclined to adopt his views, a careful study of the lengthy extracts which are given from his work will well repay the time they devote to their perusal.

Scarcity of Useful Horses in Enlgand.

Sir Walter, in introducing his subject, calls attention to the fact that in 1881 a paper was read by him at the Farmers' Club, calling attention to the neglect displayed by England in the breeding horses of a useful stamp, and the mistaken policy of selling to Continental buyers the mares which should have been kept and bred from at Home. The necessity for measures to alter the then state of things was acknowledged, but nothing done; while the Nation's deficiency in horses of a useful stamp has steadily increased. She has had to purchase from other countries to meet her requirements; and he points out that in the ten years from 1881 to 1900, 342,222 horses were imported, a great many of them high-class carriage horses, at a cost of £16,240,700, assuming that the average cost was £35 per head.



Hackney Monitor, the property of George IV

Hunter Sire: "Cognac."

TYPES OF HORSES.

Disappointing Policy Pursued at Home.

Under this heading he says :—" Many commissions on the subject of horse-breeding have been held, and volumes of evidence taken both before and since 1884. Among them the most important was Lord Rosebery's Committee in 1873, which held sixteen sittings, and examined numerous witnesses concerning the breeding of horses for purposes other than sport. The evidence taken by that Committee showed there was no scarcity in thoroughbreds, but a general decrease in agricultural horses and Cleveland Bays, while the old-fashioned hackney or roadster had become extremely rare. But the Committee gave no encouragement to any witness unless he spoke in favour of breeding from the thoroughbred as a sire. The Committee attributed the deficiency in useful horses,—

1. To the export of mares;
2. Increased profits derivable from sheep and cattle; and
3. Increased demand for horses for sport and pleasure.

He adds that the Committee seemed to think that the subject of breeding horses of substance, such as are needed for artillery, was outside the scope of their inquiry; and that, too, in the face of the increased value, which was, at the time, set upon harness-horses by France, Germany, Austria, Italy, and other Continental nations.

Horses Bred are Bred Principally for Sport and Pleasure.

Sir Walter says that, with the exception of the Shire, Suffolk, and Clydesdale breeds, horses are at the present day bred almost exclusively for sport or pleasure, and not for business. That being the case, the thoroughbred is used as a sire; and he is so, not because he has bone, substance, and soundness, but because he is a thoroughbred and has a fashionable pedigree.

This, he says, was not always the case. Between 1800 and 1850, broadly speaking, hunter sires were used. The increased speed of hounds, however, led, in the latter part of that period, to the production of horses, such as " Cognac " (a horse of which a portrait is given), with more thoroughbred blood, to the great benefit of the hunters, and the practice was continued, but, he adds, unsuccessfully, for he says, " Although the thoroughbred sire of a former generation was successfully used to beget hunters, we have taken it for granted that his greatly altered descendant is equally suitable for that purpose, and herein, to a great extent, lies the reason of our failure. The number of failures or misfits will always exceed the good ones in breeding; and the misfit got by a thoroughbred from, say, a hunter mare, full of that blood, is only too often a 'misfit' in the fullest sense of that word—a disappointment to the breeder, too light for army work, and scarcely fit for useful purposes; in homely language, it is a 'weed.' "

Purchase of English Mares and Hackney Entires by Foreigners.

Under this heading, Sir Walter points out "that in France, Germany, Hungary, and other foreign countries breeders work on very different lines from what they do in England. They breed for business, not for pleasure, their aim being to produce the highest stamp of useful horse. With this definite object they have, for sixty years and more, been buying up English mares free from bias in favour of one strain or another. The largest number of mares bought by them are those which have been accidentally blemished; but in all cases the shape, and not the pedigree, of the mare guides the purchaser. They also buy sound young mares for work and with the view of breeding from them afterwards."

"In addition to their annual purchases of thousands of English mares, foreign buyers have," he says, "since about 1830, been our best customers for hackney stallions. Foreign stud-masters, in the great horse-rearing districts, can now show us distinct and well-marked breeds of useful horses which they have gradually produced by judicious mating with the mares they have bought from us. Had those mares been retained in England, it is not likely that they would have benefited the nation, as they would, in all probability, have been put to thoroughbred stallions, and the progeny been light and weedy."

Horses wanted for the Army.

Under this heading, Sir Walter points out that there will be an enormous demand for horses, both large and small, for military purposes. He says that 54 new battalions of artillery in 1900, each of which on a peace footing requires 58 horses, or a total of 3,132, while in the time of war each battery requires 131 instead of 58 horses, and that would make the total number of horses required on active service 7,074, instead of 3,132 on a peace footing; and this is only one branch of the service.

He then says it ought to be the Imperial policy, as it is impossible to find breeding-grounds in the Mother country, to encourage in the colonies of Canada, Australia, and South Africa the breeding of horses of the useful type for military purposes; while the mission of the Mother country might well be, as at present, breeding the best of every strain as a source of supply to colonial breeders who seek to improve their local stock.

He then offers some sound advice to the Imperial authorities when he says, "Before any great change is made in the method of obtaining remounts, they should send to inspect and report on the great studs of France, Germany, Hungary, Russia, and other countries."

Profitable opening in Breeding Saleable Horses.

Referring again to his paper on Horses in 1884, Sir Walter says, as at that time, so now, English horses suitable for match pairs with

carriage and action can scarcely be obtained. Hundreds of pairs of carriage horses have during the last seventeen years been sold in London at from 200 to 500 guineas a pair, the purchasers being quite unaware of their foreign origin, *i.e.*, that they had either come from the Oldenbourg province of Germany or from the horse-breeding districts of Normandy, but bred from English stock.

Sixty years of Horse-breeding has ended in a failure.

In proof of this, Sir Walter points to the figures from the Returns of Horse Imports, that England had not succeeded in breeding horses for general purposes. He says if evidence be required to explain how we have failed to supply the nation's wants, it is only necessary to refer to the reports of the various commissions which have been appointed to inquire into the subject of horse-breeding, and more particularly to the report of Lord Cathcart, who makes the cogent remark "that, in addition and supplementary to blood, we must have substance from somewhere." He adds: "The truth is, that we have been working as though blood necessarily gives substance. This was the case a hundred years ago and less, but it is true no longer; and we must divest ourselves of the idea so resolutely held that the thoroughbred is the only strain which can improve our horses. Like foreign breeders, we must seek bone and substance where those qualities exist, and not where they only used to exist."

The Racehorse of the Eighteenth Century.

Under this heading, Sir Walter, among other things, says, "the modern racehorse, superior as he is in point of speed to his ancestors of a hundred and a hundred and fifty years ago, is wanting in those qualities which would fit him as the sire of useful horses."

During the eighteenth century and the first quarter of the nineteenth, the racehorse combined speed with stoutness. The early thoroughbred averaged little more than 14 hands 2 inches in height, resembling the three famous sires from which our racehorses are descended. The Bryerly Turk, the Darley Arabian, and the Godolphin Arabian were all under 14.2 hands in height. These were the horses—mere ponies compared with the thoroughbreds of to-day—which performed the tasks of which we read in the old turf records between 1718 and 1764. In October, 1718, at Newmarket, twenty-three matches were made, and in twenty-two the distance was 4 miles. Four miles was the usual length of race, but races of 6 miles were quite common, and a match in the old style was run in three heats. The weights were prescribed by law, and varied from 10 to 12 stone in accordance with age.

Six miles races went out of vogue before the end of the eighteenth century, but the 4 miles races in heats were continued during the earlier years of the nineteenth century, being maintained by the Royal Plates.

Such horses as "Shark" and "Hambletonian," whose records are given, had bone and substance. The work they were called upon to perform required the highest qualities of the horse—staying powers and ability to carry weight. "Shark" was foaled in 1771, and was got by "Marsh" out of a "Snap" mare. He started twenty-nine times, and won nineteen times, receiving six forfeits and paying four. "Shark" was sent to America, and laid the foundation of the famous "Snap" blood.

"Hambletonian" was foaled in 1792. He was got by "King Fergus" out of a mare by "Highflyer." "Hambletonian" was only once beaten, and on that occasion he ran off the course just after starting.

These are animals which could be relied upon to run three 4-mile heats in an afternoon, and could therefore be depended upon to produce stock with their own valuable characteristics. The modern racehorse has undergone a great change from his progenitor of a century ago; but, nevertheless, the modern breeder expects to beget stock similar to that got by the old stamp of racehorse, whose height never exceeded 15 or 15.1 hands.

Sir Walter then calls attention to a principle in breeding well known to the skilful experienced breeder: that in the breeding of every species of animal the endeavour to obtain one quality, when it succeeds in producing the quality sought in a greater proportion, often produces manifest deterioration in other attributes. Such has been the consequence of aiming solely at speed; other essentials, such as strength and endurance, have been in a great measure lost.

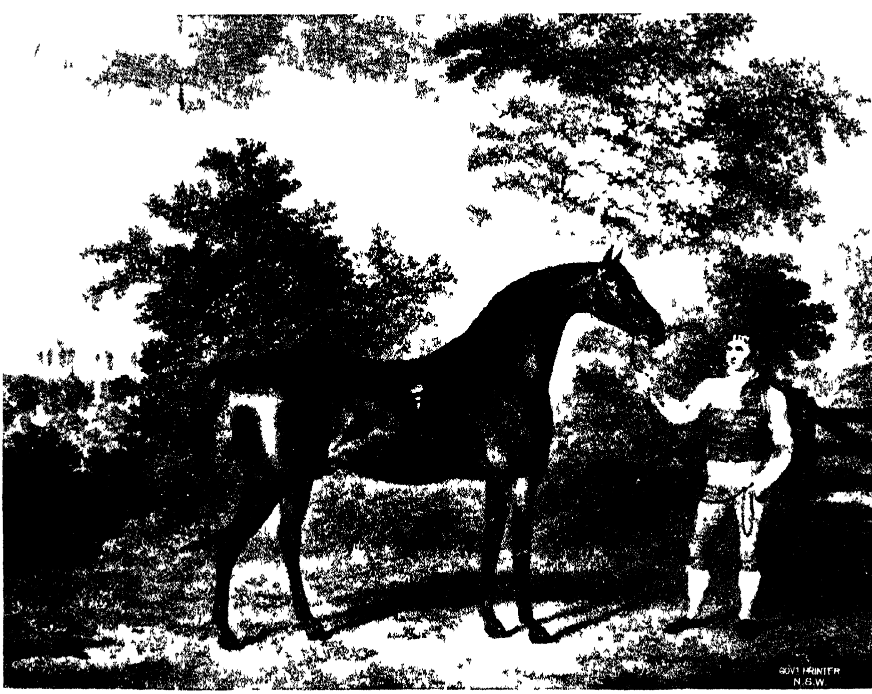
He says he would be the last to deny the merits of the thoroughbred as a sire for improving our breeds of horses where the quality of speed is required. Foreigners recognise his value where speed is needed, and they use the thoroughbred for crossing with sizeable mares.

Racehorses early in the Nineteenth Century—Siring Hunters' Mares.

He points out: "Until about 1831 it was the prevailing opinion of hunting men that thoroughbreds were not suitable as sires for hunters, and were only used in breeding for the Turf. But in the course of time, as hounds were bred for greater speed, faster horses were required to follow them, and then grew up the practice of crossing the hunter mares with thoroughbreds." Some owners went so far as to ride the thoroughbred sire to hounds; but we must always bear in mind that the thoroughbred of the period referred to was still a stout horse, able to gallop a distance and carry a heavy weight.

Such a horse was "Orville," whose portrait is given, who may be offered as a representative of the racehorse of a century ago. He fulfilled twenty-two engagements, of which he won eighteen. He was second once, received forfeit twice, and "walked over" once. His successes included the St. Leger of 1802, and won races under all weights, including a King's Plate in 1805 under 12 stone. On 24th

A Covert Hack, the property of the ninth Duke of Hamilton.



Thoroughbred "Orville," foaled 1799.

September, 1804, at Doncaster, he won two races, one in 4-mile heats, the other in 2-mile heats.

The "Colonel" was a good horse of a generation later. He was bred in 1825. After winning the St. Leger, he was sold to George IV for £4,000, and won many important races in 1830 and 1831.

The Introduction of Short Races and Light Weights.

Sir Walter points out: "The old-fashioned race run in 4-mile heats began to grow less popular during the last quarter of the eighteenth century," and the tendency to reduce the length of races, and also the weights carried, became marked in the earlier years of the nineteenth century. At the Newmarket Craven meeting of 1820 there was one race of about 3 miles, five of 2 miles or over, twenty of about 1 mile, and two of under 1 mile; while at the Craven meeting of 1900 there were three races of about 1½ miles, six of about 1 mile, and eleven of 5 or 6 furlongs.

In 1832 a new schedule of weights was issued for the Royal Plates. From about that time the system of short races and light weights began to develop; and as it developed, the character of the racehorse underwent a change. With every desire to produce thoroughbreds possessing power as well as speed, breeders have found themselves unable to reproduce the former quality and successfully compete for the great prizes of the Turf. To be successful in these days the race-horse must possess the utmost speed, but need not be able to travel at speed for a greater distance than a mile and a half at most, and if he can carry 9 stone he is considered a weight-carrier.

The Roadsters of a Century ago.

Thoughtful writers, he says, foresaw the result of the change in the English turf more than sixty years ago, when thoroughbreds of stamina and substance were far more plentiful than they are now.

The author of "English Racers and Saddle-horses in Past and Present Centuries" declared that at that date "there are powerful reasons for concluding that the single quality of speed possessed by the modern (1836) racer is a bad substitute for the fine old union of speed, stoutness, and structural power possessed by the old racer." The racer of the thirties was lighter than his ancestors; but he was far stouter and truer made than his modern descendant. "The older race-horses," wrote this author, "were swift enough to enable the general breeder to produce excellent saddle-horses. Our roadsters were formerly admirable and plentiful, while at present a compact powerful roadster, with free action, is scarcely to be bought at any price. It is obvious that the horses of our cavalry are much deteriorated, and that many of them could not go through a single campaign."

A fine sample of the old-fashioned saddle-horse is shown in the picture of the ninth Duke of Hamilton on a cover-hack here given, and reproduced from George Garrard's picture of the duke published in 1797.

Another example of the old-fashioned roadster is "Monitor"—a very fast hackney which belonged to George IV. This horse was the son of the famous "Phenomenon," who traces his descent in a direct line to the "Darley Arabian." The "Darley Arabian" begot "Flying Childers"—the speediest racehorse of his time, and was considered by many a better horse than "Eclipse." The portrait of "Monitor" which is given shows the best stamp of the old "Norfolk hackney"—muscular, hardy, and sound of constitution and limb. This breed was the ideal roadster.

Horse-breeding Abroad.

Sir Walter Gilbey next tells us what foreign nations are doing in horse-breeding, and calls attention to the excellent opportunities there have been during recent years—at the International Shows held at Antwerp, Hamburg, Amsterdam, Vienna, Brussels and Paris—of comparing the results of the various systems and methods of breeding adopted by these nations.

The information he gives on these subjects is here published in a condensed form, and will be of great value to us if we are, as it is hoped we are, about to take the necessary steps to improve the class of horses in this State to which he refers; and this improvement must come before we can obtain a share, as we ought to do, not only of the Imperial, South African and Indian remount trade, but also of that of the London high-class, high-priced carriage-horse now bred—not in the United Kingdom to any extent, but principally in France, Germany, Hungary, Austria and Italy, whose breeders are, at the prices these horses realise, even if they sell to the dealers, handsomely paid for their skill in producing such high-class horses, well matched pairs of which sell in London at from £200 to £500; while ours, affected as they have been with a mania for racing sires, or sires of that blood, have for many years, with a few exceptions, been breeding their saddle and light harness horses at a loss.

When, however, it is said that the information here given by Sir Walter Gilbey is of great value, it is not to be inferred that our breeders are recommended to adopt any of the Continental systems as such, although the results show that they are all worthy of close study and consideration, but that it is of value, inasmuch as it shows that the right sort of remounts can be bred by what may be termed the Continental system, and that there is a profitable market for the right class of carriage pairs in London, but that the competition our breeders will encounter, if they lay themselves out to breed first-class carriage pairs for that market, would be strong.

[*To be continued.*]

The Indian Wax Scale as an Orchard Pest, and its Control.

(*Ceroplastes ceriferus*, ANDERSON).

WALTER W. FROGGATT.

IN the August number of this *Gazette* of 1897, a general account of this introduced scale-insect was given, when noticing the different species infesting plants in Sydney gardens. The scale was then noticed to be spreading over suburban gardens, damaging *Pittosporum* hedges in particular. It was also known to have a wide-spread range among our bush shrubs and plants, having a marked preference for the "Native Blackthorn" (*Busaria spinosa*), a prickly shrub closely related to the *Pittosporum*. As this shrub grows on uncultivated land, and springs up rapidly in the lanes and roads between orchards all over the coastal districts, the Indian wax scale followed its chosen food plant, and very shortly after the former paper was published it was recorded for the first time as infesting mandarin trees in the St. Ives district. Since then it has spread over a large number of citrus orchards, where it has covered the branchlets of lemons, oranges, and mandarins with its unsightly masses of white wax-like secretion.

Persimmon trees are also very readily attacked. I saw it upon them near Manly three years ago, and at St. Ives there are trees growing in some of the infested orchards that have all the twigs and branches so thickly incrusted with wax scale that the bark is hardly visible.

It is somewhat remarkable that though described as far back as 1790 by Dr. Anderson upon the twigs of *Celastrus ceriferus*, and widely distributed over the Central Provinces of India, it is a somewhat rare species, and though, according to Watt,* sometimes found upon the tea plant, "nowhere occurs in sufficient abundance to justify it being classed as a tea pest."

The wax-scale in June is nearly adult, but shows no signs of eggs. Denuded of the surrounding wax, the female is a top-shaped (turbinate) creature, rounded at the head, and tapering to a point at the tip of the abdomen. The undersurface resting against the branch is flattened, but shows the outlines of the head and legs. It is of a uniform dull red colour, and measures about 2½ lines in length. The enveloping wax, at first pure white, becomes more or less discoloured by fumagine, which also blackens the foliage and fruit later on in the season. It has an irregular but uniform pattern, swelling out and slightly crimped on the edges, and rounded on the summit, when it measures ¼ in. diameter.

The enveloping substance is not exactly either a wax or greasy exudation. It contains a considerable amount of water, which can be squeezed out between the fingers, but if it comes in contact will stick

*Watt: "The Pests and Blights of the Tea Plant."

to the clothes. It is strictly a branch scale on citrus trees, following along the tiny branchlets right to the base of the fruit-stalk, but never settling upon the fruit or leaves. Another curious thing is that it does not appear to check the growth of the tree, or cause even the smallest twigs to die back, however thickly the branchlets are encrusted with the greasy mass. The damage is caused by the fumagine falling on the fruit, covering it with a black smut, very difficult to rub off when fit for market; but though there is no apparent damage at once, such a host of parasites subsisting upon the sap of the tree must seriously affect it in the course of a very few years if neglected. At the present time this scale is a serious pest upon citrus-trees in the Ryde and Parramatta districts, and many experiments have been tried to destroy it upon the trees. Kerosene in any form does not appear to have much effect upon the coccid when adult, as the enveloping wax protects the enclosed female and her eggs.

I am, therefore, very glad to be able to report that a remedy has been used with great success by a number of fruit-growers in the St. Ives district, in spraying with a solution of washing-soda, which has a corrosive action upon the wax, and, eating it off, leaves the coccid exposed and dead.

Through the courtesy of Mr. Stephen I. Pierce, of St. Ives, I visited his orchard in July and examined a number of trees that had been sprayed about three months before, and in the plate accompanying these notes is given a picture of one branchlet that has not been sprayed, and one that has been once sprayed with soda. Mr. Pierce informs me that, as far as he knows, the soda-wash was first used by his neighbour, Mr. J. Hughes. A number of formulæ regarding the strength used without damage to the foliage have been tried, and he finds 1½ lb. of washing-soda to 4 gallons of water kills all the wax scale it touches, and does not harm the foliage. He also says that, by adding a tea-spoonful of caustic-soda to the washing-soda, he found it "bit" better.

In the illustration are two branches taken from trees in this orchard, one of which shows the infested branch, and the other a branch which was as badly attacked and sprayed three months ago.

Fumigation for Destruction of Indian Wax Scale.

W. J ALLEN.

Since the publication of my last report on the experiments with fumigation, carried out in the Glenorie district, I have been in receipt of invitations from all parts of the State to give practical demonstrations in this method of cleaning trees, and have, in consequence, met a good many growers who have adopted this system of clearing their trees of scales. Many of these have, without further information than that given by me in the *Agricultural Gazette*, made their tents and carried out the work of cleaning their fruit, and, with the exception of an odd scale or two, cleaned the trees.

While visiting The Oaks district for the purpose of giving a practical demonstration in fumigation in the orchard of Mr. W. J.

A. A twig from an infested tree, untreated. B. A twig from an infested tree that has been fumigated (see Mr. Allen's report, p. 920). C. A twig from an infested tree that has been sprayed with a solution of common washing soda. D. A twig from infested tree close by, untreated (see Mr. Froggatt's report, p. 919).

The scale that still adhere to the treated twigs in each case were found upon examination to be all dead, and would disappear in the first good fall of rain.

DESTRUCTION OF INDIAN WHITE WAX SCALE.

Moulder, on the 22nd of February last, I was able to try the effect of this treatment on the Indian White Wax Scale (*Ceroplastes ceriferus*). By that time of year the larvæ had nearly all left the protection afforded them by the mother scale, and had settled down at different places along the limbs and twigs of the tree. At this stage, and before they become covered with the thick wax-like covering, is the time to destroy them, and this can be done by either fumigation or spraying with the special resin wash for citrus trees, both of which are good. I, however, prefer fumigation, as there is very little danger of missing more than an odd one here and there on the extreme ends of branches pressing against the tents, the fumes finding their way to every part of the tree, whereas, with the most thorough spraying, it is very difficult not to miss parts.

Mr. Moulder had three or four trees very badly affected with this scale, and I operated on the worst of these with, I am very pleased to say, very satisfactory results. Two months after the trees were treated, Mr. Moulder sent me twigs of the fumigated trees, and also of those alongside, which had not been treated. The treated twigs were, with the exception of two live scales, clean, while the untreated twigs were covered with live scales throughout their whole length. About the middle of June I paid a visit to Mr. Moulder's orchard for the purpose of making a personal inspection, and to ascertain how the trees were looking, and I found that, with the exception of one tree which had a good many live scale on one of the twigs at the extreme top of the tree, I could find only an occasional live scale, notwithstanding the fact that the trees treated were the worst in the orchard, while the adjoining trees were covered with scale. I am inclined to the belief that the few live scale found in different parts of the tree were carried there by birds, and that those found alive on the terminal twig on the top of the tree must have been protected from the fumes by becoming enclosed in a fold of the tent. While at this orchard I cut two twigs, Fig. A from an untreated tree, while Fig. B was taken from one of the worst branches from a treated tree. On Fig. A the young scale can be seen dotted all over the twig, while on Fig. B can be seen the remains of the old scales, but there is not a live one on the twig, although, before treatment, the twigs were almost covered with the scale.

Fumigation for Red and other Scales.

In conclusion, I would like to say a word or two as to the time of year for fumigating, the length of time to fumigate; and my reasons for recommending certain months. In the first place, I would never fumigate fruiting trees later than March, as when once the fruit is full grown, and the scale killed on it by fumigation, it is found very difficult to brush it off, as the dead scales adhere more firmly to the fruit than do the live ones. Fumigation is best carried out during the latter part of August or September, before the trees begin growing, as by treating them at this time of year it cleans them, and other conditions being favourable, it enables them to put on a good growth during the growing period, as they, at least, have no scale to retard their energies.

Trees which are not fumigated before the growth starts in the Spring may be treated after the first growth is over, say in December, or later still, during February or early March, as scales destroyed at this time will drop from the fruit before it is ready for market, thus giving the grower clean fruit which will command the highest prices.

If the white louse is found on trees which are being fumigated, it is best to increase the dose by about one-fourth, as it is found at times that a charge which will kill red scale will not destroy all the white lice. the same remarks might apply for the treatment of Brown Olive Scale.

By treating trees in February all scales can be easily destroyed with the one treatment, including the Indian White Wax Scale, and the operator can soon find out whether his work is being properly done or not.

He must be sure to get the full size of the tree to be treated, and in measuring and weighing the acid and cyanide respectively, it is best to go a half ounce over than under, because, if too small a dose is given, the scale will not all be killed, whereas if a little two much is given, the tree will not suffer, and all scales will be killed.

Also, care should be taken to avoid hot days for the operation, nor should it be done in the hottest hours of the day. The work is best done at nights or on cool cloudy days.

Mandarins and lemons do not suffer so much from the day treatment as do the oranges, so that if any trees are to be fumigated in the daytime it should be the mandarins and lemons.

Cinquatina Maize.

A small deep yellow corn, almost round. Perhaps one of the most useful and profitable varieties to grow for the poultry. Considering that twenty-seven seeds were sown on the 7th of February, and grew very rapidly through the dry weather in sandy soil, slightly manured with stable manure on the surface of the soil, to prevent the sun from burning the roots, as the roots grew almost on the surface of the soil. It is a slender stem variety, producing very fine deep green leaves, growing to the heigth of 4 feet, and on the 27th March some tassels appeared, afterwards producing very fine cobs, when the earliest cobs, perfectly ripe, were gathered on the 5th of June, and on the 23rd of June thirty-seven cobs fully matured were picked. A few days afterwards all were shelled, and produced 4 pints of seeds, or an average of 29 bushels 3 pecks to the acre, which, considering that 1 pint contained 5,900 seeds, speaks very highly of its value as a poultry food. No doubt, under favourable conditions and sowings made in September, far better results would be obtained. My intentions are to give it a fair trial against some of the earlier varieties, such as Early White Pop Maize, small Ninety Day, Early French, Early Yellow Pop Maize. Corn for poultry is generally very scarce.—F. C. King, Labour Depôt, Randwick.

How far should Sheep be Hand-fed in times of Drought before their Value is exceeded?

W. G. DOWLING.

In the June number of the *Agricultural Gazette* I wrote an article "Artificial Feeding of Sheep in Times of Drought," and this paper is intended as a sequel. In discussing an opinion of this nature one must leave out the humanitarian side of the question, for in the majority of cases they are only fed from an £ s. d. point of view, devoid of all sympathy for the dumb creature. Some owners have let the majority of their flocks die, alleging that the money they would have laid out in feed will go a long way in replacing the sheep that die, and these utterances come from men who are in no way impecunious. This, of course, is a very false position to take, and anyone who thinks (and there are many such) knows that, and they have almost spent their last shilling in buying food in order to save the lives of as many of their flocks as possible.

If an owner has only male sheep to feed he cannot go beyond (say) 15s. or 16s. per head at the present market value for store sheep, as few hand-fed sheep are prime. There is not the same prospective value in male sheep that there is in the female, there being no progeny to take into account—nothing beyond the carcase and fleece. All the money spent over the market value has to be written off as dead loss.

It is the opinion of many that the longer you feed the higher the value of the sheep in the open market when the drought breaks, and up to a certain point this view is correct.

It costs from 5d. to 6d. per head per week, based on this season's values of fodder, to maintain a sheep in fair condition, but they have not risen in price 6d. per week from their value when the feeding commenced. One reason that militates against this much desired state of affairs is, that once meat gets to a certain price, there are less purchasers. People who are not well off eat meat, as a rule, three times a day when it is at 4d. a pound, but when it goes to 6d. or, as at present, 7d., they equalise the situation by only taking it at one meal (that is, amongst rural people), and should it rise much higher they will only get it on alternate days, as a matter of fact, this is so in many poor families.

A male sheep (or wether) under present conditions could only be fed at a cost of (say) 15s. per head, to go beyond that (from the hard-hearted business point) would be feeding them at a loss. I have only adopted 15s. as the standard, more to convey to the reader what is meant. The value of the sheep does not grow in proportion to the the value of the fodder. If conditions were different, and the drought

was not so universal, fodder could be obtained at one-third its present price, and in that case they of course could be fed much longer.

I know flocks in this district that have been hand-fed for the past seven months; this, at 6d. per week per sheep, brings it up to the 15s. limit, and the end is not yet. So, unless the price of store wethers progresses loss must ensue.

Some owners aver that the whole outlay is a loss, but I think not, for the simple reason that the same class of sheep could not be replaced for 15s., if at all, as it has taken some owners forty years to get the sheep up to their present high standard of excellence, and the type of sheep adapted to the country on which they graze has become fixed.

Nondescripts are not so much alluded to in this paper, as they can be replaced with less difficulty, but are nevertheless worth feeding. I have so far only dealt with male sheep. Now we come to ewes. Their value far exceeds that of the wether, being the progeny producers, and where a wether can only be fed up to a certain cost the ewe can be fed almost indefinitely, because she not only makes a return each year in wool, but as a rule a lamb also and its wool; and if of a prolific nature it will not take much over a couple of seasons before she pays back all the cost bestowed upon her, and more so in a season like the present, when there are so many holdings that will have to be restocked.

Ewes of a fair quality and breeding ages or any age could be fed up to a cost of 30s. per head, or double that of a wether, and the owner would still be in pocket. At 6d. per head per week (this is the outside cost) this would keep them going for sixty weeks or fifteen months, and no drought is likely to continue that long without a break.

The wholesale method of destroying lambs, practised in many cases this season, has been too impetuous and displays in many ways want of forethought. If it has to be done as a compulsory task and a very unpleasant one to all flock-masters, would it not be better, as a first resource, to destroy all the male lambs, and then, if unavoidable, kill the ewe lambs? Many owners, if they pursued this course, would find that the ewe lambs left would not only get their mothers' milk, but also find odd foster-mothers to help them along, as in times of drought, though a very large percentage of ewes have no milk, there are many that have a little, and if the male lamb is killed, not when dropped, but after it has been cleaned and suckled its mother, as it is then that the milk begins to come in gradually increasing quantities, there would be a good supply. The number of ewe lambs saved in this way would fill up the gaps caused by deaths in the older sheep and keep the breeders up to normal numbers, enabling the owner to pursue the annual culling, so necessary in all well managed flocks, and is certainly a more merciful way of dealing with God's creatures in hard times.

Successful Culture of Tomatoes for Canning.

Dr. E. J. Dirickson, Worcester County, in *American Agriculturist*, writes as follows :—

For the past five years I have been a tomato grower to what might be considered a large extent, having 50, 60, or even 80 acres under cultivation. The smooth, round, medium red varieties are best. I will confine myself to three, all equally good—"Ignotium," "Trophy," and "Favourite." To be a good variety it must ripen uniformly and have many cells in its interior, thus assuring as much solid substance as possible.

Planting and Cultivation.

Proper planting of seed is very important. Select a light, loamy soil as near the tomato field as possible, and spread it heavily with fine stable manure, ploughing it in 5 inches deep prior to the seeding, which in this locality can be done with safety about April 10th. [In New South Wales this would correspond with about end of August, or as soon as dangerous frosts need no longer be apprehended.—Ed.] It should be well cultivated and rolled smooth.

If cultivation by the harrow is intended, mark out the rows 3 feet apart with broad and shallow furrows. Sow the seed by hand, so there will be about twenty plants to the foot, and cover lightly with a rake about ½ inch deep.

If the season bids fair to be a dry one, it is better to run a light roller over the rows of seed, after first putting fertiliser on the furrows at the rate of at least 1,000 lb. per acre. Seeds planted in this manner should grow rapidly. When about an inch high, shallow cultivation should be repeated every four or five days. The manure renders the soil very light and porous, making it easy to pull plants. They come up without broken roots or bruises.

When the plants are about 6 inches high they are ready for setting in the field. In my county, land best adapted for this purpose is a red-clay soil that has been in clover, peas, or wheat the previous season. The soil should be of a close, firm texture, well-drained, ploughed to a depth of about 6 inches, harrowed and rolled at least one month before setting the plants. If a machine is used in marking, no furrowing is necessary. If the plants are set by hand, it is best to mark the ground shallow one way, and marking with a deeper furrow crosswise immediately after setting the plants. If the fertiliser is put in the hill, it should be well scattered, as tomato plants are often killed by coming in contact with the phosphate. I generally prefer to fertilise after setting the plants.

If the ground is very dry, the plants after being pulled should have their roots puddled in mud and set out before drying. They should be put well in the ground and the earth pulverised finely around them. If a plant is very tall, it is better to lay it down in a furrow, only showing 3 or 4 inches above the soil. Having set the plants about 4 feet

apart, or, in very good soil, 5 feet apart, they should be cultivated at once, and repeated shallow cultivations should be given every five or six days. If the land has been thoroughly well prepared, and contains a sufficient vegetation from last year's crop, there is little danger of drought or scald. I believe that blight can in a measure be lessened, or even prevented, by a thorough preparation of the soil. To reach the highest possible yield, the land should be spread with manure after being ploughed—the more the better. The last working of the ground should be as nearly level as possible, and cultivation should cease when the plants have grown half-way across the rows.

The best variety of fertiliser is one that contains nitrate of soda and muriate of potash. I believe that 1,000 lb. to the acre would amply repay the producer in the increase in yield. A tomato grown on poor soil will yield about 350 1-lb. cans per ton; while the most perfect fruit, grown on rich land, will give at least 500 1-lb. cans. Therefore, not only the grower is better paid, but the profit to the canner becomes more. I have noticed land that will grow peaches in the greatest perfection is the best variety of soil for the tomato.

In the cultivation of a large field of tomatoes I have always left several roadways for hauling and handling the fruit. I generally have the fruit gathered in five-eighth baskets, rejecting the imperfect ones, but always pulling them off and throwing them on the ground. Tomatoes should not be poured from one basket to another, as it bruises them.

A tomato patch should be picked every three days and if they ripen very rapidly, it is better to pick them very close. The fruit should be of uniform ripeness when delivered to the canner and should be hauled in a spring waggon.

Disease and Insect Pests.

To prevent tomato blight, I believe if the top of the plants were dipped in a weak solution of Bordeaux mixture, it would be a great benefit. They can be easily sprayed in the bed before they are transplanted to good advantage. This, followed by spraying twice during the cultivation, will most always prevent blight. A tomato crop should never be grown two years in succession on the same land, nor should it follow a crop of potatoes.

A great deal of good can be done by destroying the moth that lays eggs for tomato worms. If there are any jimson weeds in the adjoining fields, they will always frequent these. They can be killed by paddles or destroyed by poison. A weak solution of cobalt placed in the blossom of the jimson weed will destroy a great many of them. I think fires built around the tomato patch will also help to destroy them. The egg is deposited on the under side of the tomato leaf, and, if one watches the moth, he will find that it is erratic and will visit almost the entire field in the course of an evening. Its capacity for laying eggs is immense. Perhaps several thousand will be laid by one insect in the course of a few days. The old-time remedy of using a flock of turkeys is an excellent one. To save my patches I had to resort to a weak solution of Paris green. One ounce of Paris green to 50 gallons of water makes a strong insecticide. This can be put on by an ordinary sprayer on wheels, or by hand.

Artificial Ripening of Cream, and the Cultivation of what is Technically termed a "Starter."

M. A. O'CALLAGHAN.

In ordinary dairying sufficient numbers of the organisms known as lactic acid-producing bacteria will get into the milk and cream from the atmosphere of the dairy to ripen the latter by what might be termed the natural process. When, however, cream has been pasteurised these organisms have all been destroyed, they being about the first to succumb, and it becomes necessary for the purpose of ripening as well as for the purpose of imparting the desirable flavour, which properly ripened cream has, to add these organisms artificially and in large numbers. For this purpose pure cultures of the organisms are made in a bacteriological laboratory, from whence they are sent to the factories in the country in thoroughly sterilised bottles in which they will keep pure and vigorous for many weeks if the bottle is not opened. The factory manager uses these pure cultures for the purpose of making what is known as the "starter," and in due course he adds this "starter" to his cream, thus introducing into it large numbers of one species of micro-organism, with the view to having only one fermentation produced in the cream during the process of ripening. These organisms decompose the milk sugar and form lactic acid therefrom, thus producing a uniform ripening of the entire vat of cream.

Churning.

The cream having been thoroughly ripened, the next step in butter-making is to churn it, having first ascertained that it is of the desired temperature, and that the churn is in a proper condition to receive the cream. What is meant by the proper condition is: the churn should be cool, perfectly clean, and not in any way suffering from the effects of decay. In considering these things you should have to consider the churns themselves, and what might be termed a suitable churn. The desirable points in a suitable churn are:—1. Good wood, which neither imparts any taste to the cream, nor which will absorb moisture too easily. For this reason hard woods are preferable. Frequently soft woods are used for the manufacture of churns which readily decay, and it is not uncommon to find among our factories some with churns showing large cavities in the sides or ends. It is very difficult, if not impossible, to thoroughly clean such churns, and when they have reached this stage they should be discarded. 2. It should be sufficiently large to do the work desired without over filling it, it being a recognised thing that about one-third of the churn should be left

unfilled, so that the cream may have plenty of air during the process of churning. 3. It should be capable of being easily worked, and made so that the butter can be easily removed from it. It is a common thing to see some box churns with small apertures for removing the butter. This results in loss of time and waste of butter, not to mention the difficulty in cleaning such machines. However, one whole side of the concussion or box churn now generally used in this country opens out, and the butter-maker is able to look into all corners of the churn and shovel the butter with wooden shovels quickly therefrom. 4. Facility for churning. This is not the least important point to consider when selecting a suitable churn. Not alone should the churn be so constructed that all corners can be reached by the brush, but it should also be so fixed that its legs and the floor underneath it can be thoroughly cleansed daily.

When the cream is ready for churning it, strictly speaking, should be strained into the churns, so as to prevent any particles of dirt or pieces of partly churned butter, which generally contain a very high proportion of casein, being introduced with the cream. These particles of semi-churned butter are caused in two ways—either by inattention to the milk flow in separating (that is, if the inflow is considerably reduced or stopped altogether for a short time, the cream becomes partly churned in the separator and issues in hard lumps therefrom), or, as in the case of factories to which cream is carted long distances, by the partial churning of the cream against the can lid. These latter should be removed by the strainer before the cream is passed into the ripening vat; but to eliminate all such particles, and so avoid one at least of the causes of motley butter, the butter-maker will do well to strain all cream into his churns.

Ventilation.

After the cream has been placed in the churn, the first thing to attend to in all closed churns is the ventilation. The churn should be turned slowly five or six times, and then stopped, opening the ventilator to admit of the gas that is being set free escaping from the churn. Some churns have an automatic ventilator, and then it becomes unnecessary to stop the churn or attend to the vent. In the open churns, such as the Eavendon and Streamlet, the question of ventilation requires no attention. The vent having been attended to a couple of times, the churn may now be allowed to slowly accumulate speed, increasing it as the period for the "breaking" of the cream, as it is termed, arrives, and when the particles of butter have just formed into small grains the speed may be decreased gradually. The time from the starting of the churn until the cream breaks will depend on the ripeness of the cream, the temperature, and on the class of churn, as well as on the speed of the churn. The time occupied is, however, generally from twenty-five to thirty-five minutes. When the butter is about to come the churn should be stopped and washed down, thoroughly washing all cream that may have become deposited on the lid or in the corners, so as to secure an even churning. Cold water is also useful at this stage to facilitate the separation of

the butter granules from the cream serum. However, if the cream was first-class, too much water should not be added, or the fine nutty flavour so much esteemed in fresh butter will be partly washed away. On the other hand, if the cream has been a tainted one it will be a benefit rather than an injury to give it a considerable amount of water at this stage, because they are ill flavours, not good ones, that are being washed away. The churn should now be restarted and allowed to run slowly until the butter has developed into grains nearly as big as a grain of wheat, or about the size of No. 3 shot.

Washing.

The butter is now ready for washing, a part of the process of butter-making which varies considerably according to the tastes of those for whom the butter is required, and according to the proximity to market. The usual method of procedure is as follows:—The buttermilk is drawn off from the bottom of the churn until it is nearly all removed, leaving, however, sufficient in the bottom of the churn to keep the butter partly afloat. Water should then be poured in, and the churn turned round a couple of times, when the tap may be again opened and the washings removed. This portion of the washing will contain a good deal of buttermilk, and it should not be thrown away. Fresh water is now added sufficient to float all butter, and the churn is revolved for a couple of minutes. This water, which might be really considered as the first washing, should be removed in a similar manner, and the churn again filled as before. It should be again revolved, and this water should come away practically clear. If it shows milky, a third washing should take place, but this will seldom be necessary.

The temperature of the water used for these washings should not be above 56° F., and if it is as low as 52° all the better.

Effects of Over-washing.

The question of how much to wash butter is a very much debated one, but when it is considered that butter made in Australia for export to England has to keep for two months at least, a very wise policy to adopt is to wash the butter until the water comes away clear. Effects of over-washing are not of much moment under these circumstances, because all the delicate aromatic flavours which freshly-made butter possess will have vanished before our product reaches England, whether it is over-washed or under-washed. Butter made for use (say) twenty-four hours after it is finished, requires very little washing, and in such an article we expect to get the delicate flavour of a fine freshly-made butter. The effect of a lot of washing is to remove these flavours. On the other hand, if we under-wash, or do not sufficiently wash, the butter which is intended for export, the result will be that some buttermilk will remain behind, and as this is of a nature which is readily acted on by bacteria, the butter will quickly decompose, and by the time it reaches England it will be rancid and tallowy.

Working.

When butter has been washed, the next step is to salt and work it, which two operations are performed at the same time by the aid of a machine termed a butter-worker, or butter-table. The butter is removed from the churn while it is still in grains, and placed on this table or worker, care being taken not to put too much on the table at one time, otherwise there is a liability to have the butter imperfectly worked or perhaps greased. The machine is now made to revolve a few times to express some of the moisture, and the salt is then evenly distributed over it. I cannot too strongly impress on our factory managers the necessity for adding the same percentage of salt to every churn of butter made, unless whenever a specially salted article is desired. The English consumer is very particular in matters of salt, and he demands a uniformly salted butter. This can only be properly done by weighing the salt or by having a measure which contains a known weight of salt. The table is now allowed to revolve again, and the process of working in the salt and working out the moisture begins. A perfect working might be described as one which will do these functions with the least possible amount of friction or working. Also, in working butter it should never be allowed to pass round under the roller without being turned, because in this way the same portions of the butter get exposed to the friction, and this, if not prevented, will result in a greasy butter. All working of butter should take the form of pressing, not of rubbing.

Salting.

The butter may be said to be worked when the salt is thoroughly mixed with it, and when sufficient water has been pressed out. To do this two methods are in use, namely, that of mixing the salt and finishing the product in one working, and that of adopting the method of two workings, with an interval between sufficient to allow the salt to dissolve. The latter is most favoured in countries where up-to-date butter-making has been made a study. The advantages of working the butter a second time are—(1) It insures a more thorough mixing of the salt with the butter; (2) and it enables more moisture to be removed from it; and (3) it enables the butter-maker to do this without spoiling the texture of the butter by making it greasy. The amount of salt added to butter will depend on the requirements of the market. Since the French educated the English consumer in the taste of unsalted or slightly salted butter, the tendency has been to use as little salt as possible—that is, only just enough salt to bring out the flavour of the butter. The amount usually found in butters suitable for the London market is about 2 per cent., and rarely or ever more than 2½ per cent. The common practice in this country is to add 3 per cent. of salt to all butter intended for export, but in the working of the butter this becomes reduced to about 2 or 2¼ per cent.

Effect of Salt on the Keeping Properties of Butter.

Before the days of centrifugal separators and winter dairying, it was the custom to put by sufficient butter from the autumn production to meet the requirements of the winter months, and in order to preserve this butter a considerable amount of salt was added thereto. At that time the main portion of the butter sent to England was made in Ireland, where it was the custom to add 5 to 6 per cent. of salt to butter intended for keeping purposes. Additional salt was also very frequently added in the shape of warm brine, which was poured into the casks after the butter had been packed. There is very little demand for butter of this kind nowadays, save in the mining districts of England, and as it is not required to be held so long, the percentage of salt has been reduced 4 or 5 per cent., while the custom of adding brine has been practically discontinued. I need scarcely say that this class of butter is only made at the farmhouses, creamery butter, as made in Ireland, containing about the same amount of salt as that made in this country. It is sometimes claimed that such a small percentage of salt as that now used in creamery butter has no effect in helping the butter to keep, but I do not altogether agree with this. Such a small percentage of salt has undoubtedly very little preservative effects, but it has some.

Effect of Salt on the Water Content and Appearance of Butter.

Brine Salting in the Churn.

The salting of the butter in the churn after it has been washed, and while it is still in a granular form, has been practised by some in preference to dry-salting on the butter table. Brine-salting has its advantages and its disadvantages. Its main disadvantage is that in factories where a considerable amount of work has to be got through daily, it would delay the churning so much as to upset the ordinary working of the factory. In most of our large factories the man attending the churns has to keep going all the time, and no sooner is he ready to remove the butter from the churn than he requires to fill it again. Hence the delay that would be occasioned by brine-salting, which would occupy at least half an hour for each churning extra, is too great to warrant the system being introduced into our large factories. The other disadvantage attending this system is that it is not possible to mix more than about 1½ per cent. of salt with butter thus treated. Its advantages are, it enables the salt to be uniformly distributed throughout the entire mass without going through the process of working, also streaky butter becomes almost an impossibility under this system. The butter thus salted will require less working than when butter is salted on the table, because all that is now required is to bring the butter into a compact condition suitable for packing into vessels for market. This is an advantage, because, practically speaking, the less working butter gets the better. It is a very useful system to adopt when small quantities are being made for immediate consumption, or when butter is being made for show purposes. The method is as

follows: After the butter has been washed for the first time a saturated solution of brine is poured over it, and the butter is allowed to remain in this for about ten minutes, first giving the churn a couple of revolutions to distribute the butter grains evenly in the brine. This is then drawn off, and a fresh quantity of brine introduced into the churn. The butter is again allowed to stand in the brine for ten or fifteen minutes, when it should be sufficiently salted. The best way to make the brine is to warm the water and dissolve as much salt as possible in it, allowing the water to cool afterwards to the desired temperature for washing. Brine-salting has one other advantage, namely, that when salt is added to water the temperature is lowered, and to factories that do not possess refrigerators, and hence are unable to cool the water as low as they should like to do, it will be an advantage, if even though they should salt the butter on the table afterwards, to wash it with brine water in the churn, because this will have the effect of hardening the grains more than would the ordinary water.

Colour and Colouring of Butter.

The question of colour, while it has becomes of less importance of recent years, is still one worthy of the serious attention of butter-makers. While very little is understood regarding the substance which causes butter to have its distinctive colour, we do know that the colouring matter is intimately associated with the fat globules, and also that the foods which the cows receive affect very materially the colour of the butter which is made from their milk. Those breeds of cattle that yield milk richest in butter-fat have the fat globules larger than other breeds, and they also yield a milk which makes a butter of a higher colour than any other breed of cattle. The breeds most remarkable for this are the Guernsey and Jersey. These breeds are supposed to have an advantage over other cattle for the purpose of making butter of superior qualities, and this fact is so well established in the British Isles that there are special classes set apart for butter made from these breeds annually at the London dairy shows. The idea is that if these breeds were allowed to compete with the ordinary cattle, the butter made from the other breeds would have no chance of getting a prize, and hence these exclusive classes. Butter made solely from the milk of Guernseys and Jerseys is of a very high colour indeed, and rather higher than is demanded by the general trade of England. The judges do not give special marks for such a very high colour, but the butter made from these breeds has also the reputation of being of a better texture, more firm, and hence less susceptible to heat. The colour most favoured in commercial butter is a light bright straw, such as is obtainable when ordinary breeds of cows are in full flow of milk, and feeding on good grass pastures. As the pastuer becomes drier and shorter, and as the cows fall off in milk yield, or as the period of lactation advances, the butter gradually becomes of a paler colour, and it then becomes the province of the butter maker to add a little colouring matter which will cause the butter to be of a colour as nearly as possible like that which was obtained when the

cattle were feeding on fresh green pastures. This is one of the points which is claimed by the British trader: when he asks for a butter of uniform quality, not alone does he want a uniformly good butter, but he wants a butter of uniform colour throughout the year. To maintain the standard of colour I suggest that there should be hung up in every factory a card showing the colour desirable in a high-class butter, when the manager will have something to guide his eye throughout the year. There are several preparations on the market for the purpose of artificially colouring butter, Hansen's being about the oldest and best known, and it is a very easy matter for the butter maker to gradually increase the amount of this used, as the butter has a tendency to become paler. The butter colouring should be added to the cream before churning commences, when the colour is taken up by the fat globules and imparted to the butter. Any attempts to add colouring to the butter after it has been made will result in either one or two things, namely, streakiness or greasiness, brought on by overworking the butter in the endeavour to get the colour evenly distributed. If it ever happens that colouring has to be added to the butter after it has been made, it is best to do so by adding the colour to the salt before the latter is distributed over the butter. The Select Committee recently appointed by the British Government to inquire into, among other matters, the colouring of butter and cheese, has decided to allow butter to be coloured with non-poisonous substances. Annatto is the basis of most butter-colour preparations. When cows are hand-fed during the winter months, or during times of drought, the butter is very liable to be paler than usual, unless some succulent foods are used in the feeding, such as green maize, green oats, barley, or other forage crops. Among the foods known to produce paler butter than perhaps any others are mangolds, and straw or hay that has been allowed to become over-ripe and dry.

Packing and Marketing.

When butter has been worked sufficiently dry it should be immediately packed into whatever vessels it is intended to send it to market in. The package finding most favour in this country is the cubical box. In Ireland creamery butter is packed either into a somewhat similar box, but of the shape of the frustum of a pyramid, or into the package known as the Danish kiel, which is the package in general use in Denmark for exporting butter to England. This cask contains 112 lb. of butter, and is in shape like a small barrel. It is a very popular package in England with the merchants, but owing to the great amount of cold air space which would be lost if we used these packages for exporting our butter to England the freight would work out considerably dearer than at present. The cubical box used for packing Australian butter in is made of New Zealand white pine, a timber which is admirably adapted for this purpose, as, when properly seasoned, it is practically devoid of any smell, besides which it makes a very strong, nicely coloured box, without being too heavy, the general weight being about 10 lb.

There is a pine in the northern parts of this State and in Queensland, which, though not quite so white as the New Zealand pine and is also somewhat heavier, still is fairly suitable for making butter boxes, and I have no doubt that in later years, when the supply of New Zealand wood gets scarcer and dearer, that we shall have recourse to this Australian timber ; in fact, one or two factories on the northern rivers of this State are using it at present with success.

Despite the suitability of package we have factories exporting butter that could considerably improve on the get-up of the box, and especially in the method of branding it. Nothing helps to sell butter more than a nice clean, well-made, nicely branded box that catches the eye of the would-be purchaser immediately. Open the box, and if the packing, finish, and colour of the butter is good it is half way towards the sale before the butter is ever tasted. The finish and packing of a great many of our butters could be considerably improved on. At one time it was popular to finish the butter quite smoothly on top, but this required considerable skill to do it nicely, and without giving it a greasy appearance, and latterly it has been the custom with our factories to impress some form of brand on the top of the butter instead. These brands are of two kinds—the roller brand, which is put on by a round piece of wood on which the brand is engraved being rolled over the butter; and an engraved wooden stamp, which impresses the brand on the butter. The former method is preferable, and gives a nicer appearance.

The lining of the boxes before the butter is placed therein is a matter deserving attention. The box itself should be perfectly clean inside, and if it is not so it should be washed out. It should now be lined with parchment paper of the best quality which had been previously soaked in water containing salt and boracic acid in solution. This latter helps to prevent the outside of the butter from getting in any way tainted by the air which gets locked up in the box when the butter is being packed.

With a view to help towards the better preservation of the butter in this manner, and also to diminish the shrinkage which takes place in butter after it has been packed, by the wood absorbing some of the moisture therefrom, it has been suggested, and in fact some factories in New Zealand have used it during the last season, that the boxes should be lined with paraffine wax. The extra cost of doing this would be, done on a large scale, about ¼d. per box, which cost would be inappreciable if the quality of the butter was to any extent improved thereby. This matter of paraffine lining is well worthy the attention of our New South Wales factories.

Packing.

The question of packing seems simple enough, but at the same time it is one which betrays many errors. Open half-a-dozen boxes, turn them out, and view the contents from all sides. How many of the boxes will have perfectly smooth faces ? Some will have small cavities, some will have large cavities showing in the sides, others will have

rounded ends—all showing that there has been locked up in the box unnecessary large quantities of air, and the air which we find in many factories is not calculated to improve the quality of the butter during the voyage to England. In packing butter the main point to attend to is to pack the first piece into the corners of the box, and to pack the sides of the box well throughout. The packing should be done firmly and sharply, so as to avoid unnecessary friction, and it should be done with a straight piece of suitable wood of fair weight, which, before being used, should first be thoroughly scalded, and then allowed to stand for some time in cold water. A greasy packer means greasy butter. If the boxes are not of a correct size they will be either too full or there will be too much space between the butter and the lid, which space is occupied by air which in due time will cause the butter on top to be oxidised, and it will have, in consequence, a tallowy taste. The box should, when properly packed, be as nearly level with the edge of the timber as possible. The butter should be covered with parchment paper on top, the paper having been previously damped in the solution already referred to. If dry parchment is placed on the top of the box it will stick to the butter and destroy the appearance of the brand when the butter is opened later on. The boxes should be lidded down as soon as possible after being packed; this helps to preserve the butter better than if they are left open any time; also, if butter boxes are allowed to remain without lids standing in our factories —especially in our factories situated in the moist climate of the Northern Rivers Districts—there is a great liability to the spores of moulds dropping on the parchment in considerable numbers, where in a short time they begin to grow, staining the paper very considerably, and giving the butter the appearance of being several months old. Some of our factories suffered considerably from this last year, the result being that in some cases they have supplanted the old wooden ceilings with zinc ones. The boxes having been headed down, they should be numbered and placed in an artificially cooled room to be chilled. It is not wise to place the boxes into a very cold room—say, at 35° Fahr. —straight away, especially if the butter has not been worked a second time, because if this is done the process of the dissolving of the salt in the butter is liable to be arrested by the intense cold, and when the butter is removed from the store it may be found to have a mottled appearance.

If the butters are to be held for any length of time at the factory it is wise to have a second cold room at a temperature below freezing point, into which the butter should be transferred after it has been a couple of days in the outer and warmer room. It should be allowed to remain in the colder room until it is required for despatch to market, or for shipping purposes.

Note on the Nature of the Flour produced in the gradual reduction of Wheat.

F. B. GUTHRIE AND G. W. NORRIS.

THE following notes, taken during the milling of samples of wheat, illustrate the differences in the nature of the flour obtained during the several breaks and reductions to which the wheat is subjected. The process of milling employed was that in use in testing wheats in the Department's mill, and the wheat was subjected to as gradual a reduction as possible, consequently the number of breaks and reductions was somewhat greater than is usual.

The grain employed was of the following kinds :—

1. Farmers' Friend, from experiment plot manured with
   120 lb. dried blood.
   300 lb. superphosphate.
   40 lb. sulphate of potash.
2. Farmers' Friend, from experiment plot manured with
   200 lb. nitrate of soda.
   300 lb. superphosphate.
   40 lb. sulphate of potash.
3. Hunter's White, grown in New Zealand.

The following tables show the nature of the flour obtained from the successive breaks and reductions, the products from each of which were kept separate and examined separately :—

No. 1.—FARMERS' FRIEND.

	Percentage of Flour.	Strength	Gluten.	Nature of Gluten.	Colour of Flour.
				Breaks.	
1st	6·3	50·0	9·8	Yellowish, elastic, coherent, slightly adhesive.	Excellent.
2nd	17·5	49·0	8·4	Yellowish, elastic, coherent, non-adhesive.	Excellent.
3rd	14·6	50·0	9·3	Yellow, coherent, slightly elastic, slightly adhesive.	Excellent.
4th	11·9	54·8	12·5	Yellow, elastic, coherent, slightly adhesive.	Very good, slightly yellow.
5th	9·8	55·6	15·9	Slight yellow, coherent, elastic, and slightly adhesive.	Very good, yellow.
				Reductions.	
1st	9·5	49·5	8·5	Slight yellow, coherent, elastic, slightly adhesive.	Excellent.
2nd	17·4	50·4	8·5	Yellow, slightly elastic, coherent, slightly adhesive.	Very good.
3rd	13·0	54·8	13·3	Yellow, slightly elastic, very coherent, slightly adhesive.	Low colour.

Percentage of mill products—

Break-flour, 45·3 per cent.

Bran—fairly clean	= 13·4	per cent.
Pollard do	= 13·8	
Flour	= 72·8	
	100·0	

Nature of straight grade flour -

Colour	Good.
Strength	= 49·2
Gulten	= 10·46

No. 2.—FARMERS' FRIEND.

	Percentage of Flour.	Strength	Gluten.	Nature of Gluten.	Colour of Flour.
				Breaks.	
1st	8·0	46·4	8·78	Slight yellow, slightly elastic, slightly adhesive, slightly coherent.	Fair, slightly grey.
2nd	10·4	42 2	10 9	Slight yellow, elastic, non-coherent..	Excellent.
3rd	11·3	42·6	10·39	Yellow, elastic, slightly adhesive, slightly coherent.	Excellent, shade darker than 2nd breaks.
4th	16·0	44·0	12 2	Yellow, elastic, slightly coherent, slightly adhesive.	Fair, yellowish.
5th	14 6	48·0	14·7	Dark yellow, elastic, coherent, slightly adhesive.	Yellow clear.
				Reductions.	
1st	14·5	44 8	14 3	Yellow, slightly elastic, slightly coherent, adhesive.	Fair, rather dark.
2nd	7·4	44·0	11·8	Yellow, elastic, coherent, slightly adhesive.	Good.
3rd	9 6	44·6	14·6	Yellow, very coherent, elastic, slightly adhesive.	Good.
4th	8·2	47·2	8·2	Low colour, non-elastic, very coherent, adhesive.	Dark yellow.

Percentage of mill products—

Break-flour, 45·3 per cent.

Bran, very clean	= 11·8	per cent.
Pollard, do	= 13·0	
Flour	= 75·2	
	100·0	

Nature of straight grade flour—

Colour	Good.
Strength	= 48 0
Gluten	= 13 3

No. 3.—HUNTER'S WHITE.

	Percentage of Flour.	Strength	Gluten.	Nature of Gluten.	Colour of Flour.
				Breaks.	
1st	5·0	45·8	6·23	Brittle, dark yellow, slightly elastic, adhesive.	Fair, slightly grey,
2nd	7·9	44·0	6·39	Yellow, elastic, non-coherent and adhesive.	Very good, slightly chalky.
3rd	13 4	46·4	6·50	Do do do ..	Do do.
4th	28·3	47·2	10·11	Yellow, slightly elastic, slightly coherent and adhesive.	Excellent.
5th	4·2	49 6	12 35	Low, slightly elastic, coherent and adhesive.	Low colour.
				Reductions.	
1st	7·6	46·4	8·33	Yellow, coherent, adhesive, slightly elastic.	Fair, slightly grey.
2nd	21·0	45 8	9 49	Do do do ..	Excellent.
3rd	9·0	47·6	10·46	Yellow, coherent, elastic ,adhesive. .	Fair.
4th	3·6	47·8	8·22	Very low colour, non-elastic, adhesive, very coherent.	Very low colour.

Percentage of mill products—

Break-flour, 43·2 per cent.

Bran, very clean	=	8 8	per cent.
Pollard, fairly clean	=	17·8	
Flour	=	73·4	
		100·0	

Nature of straight grade flour—

Colour		Very good.
Strength	=	45 0
Gluten	=	9·5

In the *Agricultural Gazette* for April, 1898, pages 372 and 373, are recorded the results obtained when a hard, strong-flour wheat was subjected to similar treatment, the flour from the different breaks and reductions being set forth separately. Although the milling was somewhat different, the characteristics of the various mill-products are very similar in the case of the hard wheats and of the soft wheats now under discussion.

The flour from the breaks is stronger than the reduction flour, and, on the whole, of somewhat better colour.

The break flour is notably richer in gluten.

A very well-defined and striking characteristic, and one that is of special importance in indicating the distribution of the gluten in the grain, is the quantity of gluten in the different breaks. This is so striking as to be worth a more careful examination. The following tabular statement shows the amount of gluten contained in the flour from hard and soft wheats respectively:—

TABLE showing Gluten in the different break flour.

	Lambrigg Wheat—Hard wheat, 1898.		Farmer's Friend—Soft wheat, 1902		Farmer's Friend—Soft wheat, 1902.		Hunter's White—Soft wheat, 1902.	
	Percentage of flour.	Gluten in Flour.	Percentage. of Flour.	Gluten in Flour.	Percentage of Flour.	Gluten in Flour	Percentage of Flour.	Gluten in Flour.
1st break	3·6	14 21	6·3	9 8	8 0	8 78	5·0	6·23
2nd ,,	13·9	12 05	17·5	8 4	10·4	10·90	7·9	6·39
3rd ,,	22 6	16·06	14 6	9·3	11 3	10·40	13 4	6·50
4th ,,	3·9	25 51	11·9	12 5	16 0	12 20	28 3	10·11
5th ,,	......	......	9·8	15·9	14 6	14 7	4·2	12·35

It will be seen that the quantity of gluten obtained increases steadily with each successive break—that is to say, as the flour is obtained from the neighbourhood of the bran. In the last break, in which the bran is scraped as close as possible, the flour is extraordinarily rich in gluten, and is derived entirely from the so-called aleurone layer, and it is just this layer that supplies the bulk of the gluten. This richness in gluten is, unfortunately, not accompanied with the other characteristics which go to make a good flour, and the flour from the last break is of little value on account of its low colour.

In the case of the strong-flour wheats, this diminution in colour is accompanied by a loss of strength (see *Gazette*, April, 1898, page 373), though this is less marked in the case of the soft wheats under discussion. In other words, though the aleurone layer near the bran is remarkably rich in gluten, the gluten is deficient in the constituent (glutenin) which gives it the property of making a good dough, and the property that characterises strong wheats is the preponderance of glutenin in the gluten cells in the interior of the grain.

This fact is taken advantage of by millers in the production of "patents" and "baker's" grades—some wheats being of such a nature that the milling operations have to be directed towards obtaining the flour from the interior alone, the aleurone layer not being touched to any extent.

The Cultivation of Salt-bush for Fodder in time of Drought.

H J. KELLY,
Coolabah Experimental Farm.

THE drought which for several months past has been playing such havoc among the flocks and herds in nearly every portion of this State, and which has also extended to the adjoining ones, has perhaps been more severe in the northern portion of the Western Division, generally known as "the drought-stricken West," than elsewhere. For the last six years this large tract of country has received considerably less than the average rainfall, but for the last eleven months very little over an inch has fallen, and that small amount in several falls, the most at one fall being twenty-three points in this particular portion of the area, thus being of no benefit whatever. The country generally west of the Bogan and northwards of Nyngan has for the past four or five years been in a shocking condition, with the exception of one or two very brief periods; one being able to travel many miles in places without even seeing a blade of grass. But until a few months ago the lack of water was not experienced to a very great extent, though at present many holdings are quite destitute of water, or have an inadequate supply for stock, thus necessitating the removal of all stock from them. Some of these runs which have a fair amount of edible scrub, and in a few instances dry grass upon them, would be rented at a high figure at this critical period, but being without water are valueless until rain comes. To make pastoral pursuits payable throughout good and bad seasons in this portion of the State, provision will need to be made for a much larger water supply than now exists, should we be again visited by such a lengthy period of drought.

Also the growing of fodder for stock will require more attention if we are to divert such dire consequences in the future as we are at present experiencing. The growing of hay on this expanse of country cannot be termed a success, although some seasons fair and even large crops may be grown, but such occurrences are greatly in the minority, owing to the very light and irregular rainfall. In places only where irrigation is resorted to can there be any certainty of growing a crop every year, and very probably then the cost would exceed that of purchasing and bringing from the Central Division. The cultivation of Salt-bush would be the most profitable undertaking for providing fodder for drought time, as the harvesting expense would be done away with, and many varieties of this valuable plant, being indigenous to this western area, would be certain to grow and thrive when other crops would fail.

During the past ten or twelve years, owing to over-stocking during droughts, in many places the best varieties have been eaten out to such an extent that it is doubtful if they will again appear, unless re-sown. A few remarks concerning the best varieties and their cultivation, in which I have had several years' experience at Coolabah Experimental Farm, under the direction of Mr. R. W. Peacock, may be of interest to those who feel inclined to give it a trial. The variety best known as "Old Man" is recognised as the best, as it furnishes a much larger amount of fodder than others. It is very drought-resistant, being a deep rooter, but the too persistent eating down in dry times will prove fatal to it. Other varieties to which stock are very partial, when grass becomes scarce, and which are very nutritious, are *Atriplex semibaccata* or creeping Salt-bush; *Atriplex vesicaria*, known as bladder or plain Salt-bush; *Atriplex leptocarpa* and *Atriplex halimoides* or dwarf Salt-bush. This last named being an annual is not so valuable in long periods of drought, but after a fair shower of rain, grows much faster than the others, and is an excellent fodder.

To obtain best results, the land requires a good ploughing and harrowing, and after a good rainfall, the seed to be sown in shallow furrows in rows, and covered with a light covering of earth. For "Old Man" variety the rows need to be sown about 9 feet apart, as this variety grows into large bushes, and under favourable conditions, 9 feet will be found to be quite close enough to sow in the rows. For the other varieties mentioned, 6 feet apart will be quite sufficient for the rows, as they are much smaller, but they can be sown much closer in the rows.

The planting in rows is preferable to broadcasting, as less seed is required, and it also allows the land between the rows to be cultivated without disturbing the young plants. This cultivation should be repeated occasionally after rain, as it greatly assists the growth of the plant, but can be discontinued when the Salt-bush becomes thoroughly established, when, if not too heavily stocked, it will be quite capable of taking care of itself.

A few hundred acres of Salt-bush, in times such as the present, would be invaluable to stockowners, and as portions of many holdings are open plains, the expense of clearing land would be unnecessary, and if stocked judiciously, the one ploughing and sowing would be sufficient.

The great point in favour of Salt-bush is that stock will not eat it to any great extent while grass and herbage are plentiful, thus allowing it to grow and increase in good seasons, to be reserved until such times as all other less drought-resistant plants have disappeared, when sheep and cattle will take to it, and, not only live on it, but will fatten on it if sufficient quantity is obtainable. Such fodders as hay, chaff, or grain are not to be compared with Salt-bush for the feeding of large numbers of stock, as besides the much greater expense of obtaining the former, there is the additional cost of feeding them to stock, while this labour is entirely done away with by stock being able to gather the Salt-bush from its own stalk for themselves.

New Strawberry—St. Antoine de Padoue.

W. S. CAMPBELL.

About a year ago Mr. Krempin, seedsman, at Newcastle, was good enough to give me a small packet of seed, which he had just imported, of a new Strawberry, of which I had seen some notice in the English horticultural press.

Last spring I sowed the seed in a 5 inch flower pot covering it with a sheet of glass until the seedlings came up. The little strawberries grew very slowly for some time, but at last took a start and grew into strong plants, when I shifted them into 2 inch pots, one in each pot, and plunged these pots up to their rims in a warm part of my small garden. There were about a dozen plants in all. They then grew very quickly, some filling their pots with roots and sending out runners. I allowed some runners to grow in order to increase the supply of plants to about forty when I put a stop to this propagating work and shifted the plants into 5-inch pots and plunged these in the same way as I did in the first place.

The plants have grown remarkably well, strong, sturdy and healthy, and to my great satisfaction have produced some fruits, the first ripe one of which was gathered on the 6th June.

I notice this to be such an excellent strawberry, large, of beautiful colour, and grand flavour, and likely to prove such a prolific bearer that I think it worth while to bring it under the notice of our readers.

I find in an English weekly gardening paper called *The Garden* for September 1st, 1900, under "New and Rare Plants," this reference to the Strawberry in question :—"This is a new autumn-fruiting variety obtained from a cross between Royal Sovereign and St. Joseph, and should prove a valuable addition to the list of autumn-fruiting strawberries. Exhibited by Sir Trevor Lawrence, Bart., Bedford Dorking (Award of Merit)."

In the *Gardeners' Chronicle* for July, 1901, appears the following:—"The perpetual-fruiting varieties St. Joseph and St. Autoine de Padoue will do much to lengthen the season."

According to the catalogue of Peter Henderson & Co., New York, this strawberry is of French origin.

Late Hanging Grapes.

In an experiment at Wagga Experimental Orchard to ascertain which variety of grapes will hang longest on the vine, it has been found that Daria and Black Tokay are the best for this purpose. Large well-shaped bunches in perfect condition were taken from these vines on the 18th August.

Pruning.

(Continued from page 849.)

W. J. ALLEN.

The Loquat.

THIS also is a tree which has been very much neglected, inasmuch as the cultivation as well as the pruning have been left pretty much to look after themselves, but as it became apparent to growers that good prices could be obtained for the fruit which ripens when other fruits are scarce, it is at last beginning to receive something like its proper meed of attention at the hands of the more progressive.

Fig. 123.—Young loquat tree six months after pruning.

This tree has been largely planted for breakwinds around many of the orchards, and thus serves a double purpose, as not only is it useful as a breakwind, but it helps to pay running expenses as well, more particularly where it receives the same care as other portions of the orchard.

If it is intended for a breakwind it is well to start it with rather a high head, say, about 3 feet high. If planted in orchard form it may be started from 18 inches to 2 feet high. From this time on care should be taken to keep the tree from a too spreading growth, to prevent which a little of the side growth and lateral shoots may be removed for the first three years if the tree shows a tendency to spread too much.

Fig. 124.—Four year old tree before pruning.

When the tree begins to bear it will be found necessary to remove a few of the centre limbs,

which may become displaced from time to time, and thin out the lateral growth. Care should be taken to remove the shoots which are furthest from the main limb, so as to keep the tree as strong as possible.

The trees generally bloom in the fall, and the fruit is sufficiently far advanced by the end of May to enable the grower to thin if the tree shows signs of carrying too heavy a crop. From the base of these fruit spikes or clusters other fruit-spurs start, varying in number from one to three, which in their turn throw out fruit-buds for the following year. In cases where these are too numerous

Fig. 125. Four-year-old tree after pruning.

Fig. 126.—Six-year-old tree before pruning.

Fig. 127. The same tree after pruning.

they should be thinned out. This will tend to throw a stronger growth into the remaining spurs, which in their turn will produce good-sized fruit.

The Sultana.

This grape, but with very few exceptions, is not found growing under the same conditions here as at Mildura and other centres where it has been planted extensively. In our Departmental vineyards it is grown without irrigation, and at Wagga is found to do well, and has proved very profitable, and several fruit-growers and farmers in the surrounding district are at last planting a few, but none have as yet gone in for them extensively. At the Hay and Wentworth Irrigation Settlements small areas have been planted, but it is too early yet to say with what results.

The method of pruning which we have adopted is most simple, and so far with very satisfactory results. At the time of planting the root of the vine is trimmed back to 6 or 8 inches long before planting;

Fig. 128

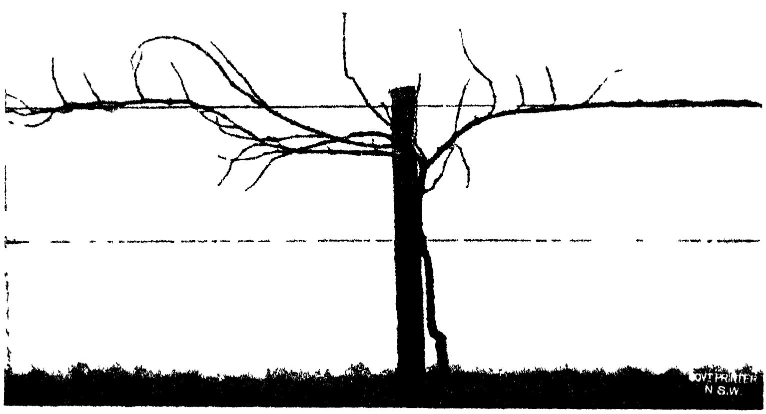


Fig. 129.

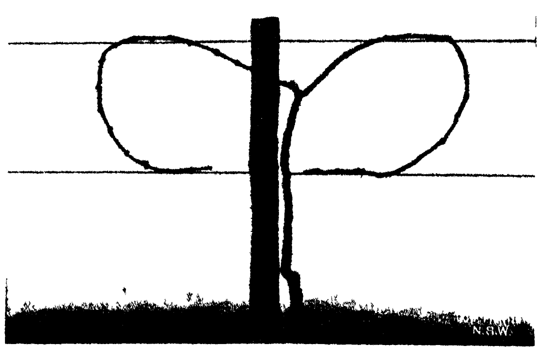


Fig. 130.

the vine is then set in to a good depth, and the top pruned back to one spur of last year's growth, on which are left two buds. It is well to have a two-wire trellis erected, so that during this first year one main

shoot only be allowed to grow, which may be tied to the lower wire first and the upper one later on.

If we get a good strong cane reaching the top wire, that is all we could wish for the first season, and at the first winter pruning we cut any side or excessive growth off, leaving the straight cane. The following year we allow two leaders to start from the

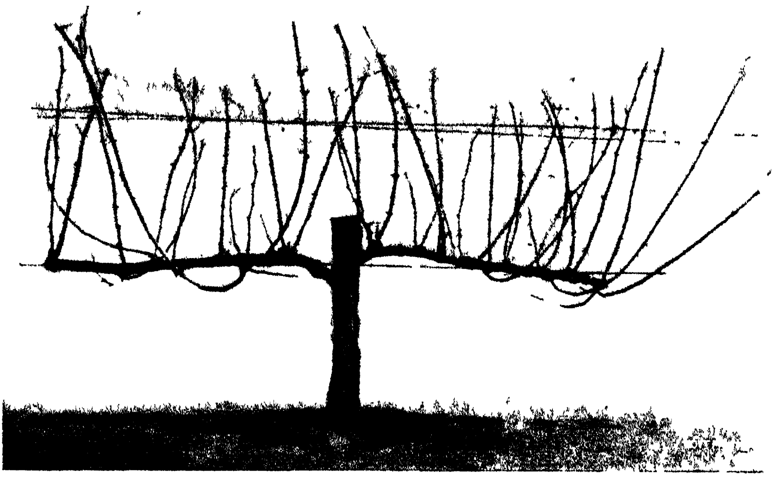


Fig. 131

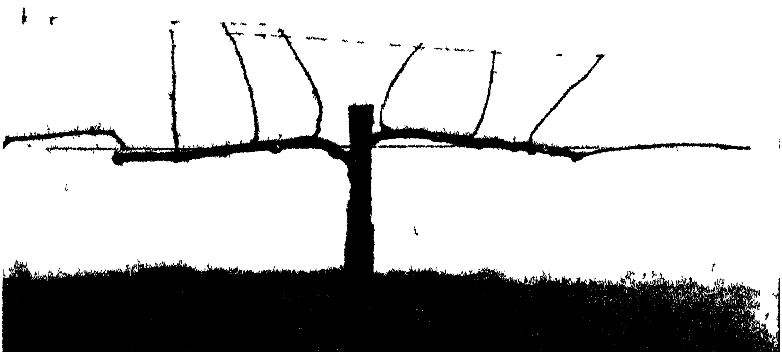


Fig. 132.

top of the cane, training one in either direction, and keep others pinched back, so as to throw a good flow of sap into the main leader, which is to be used for carrying the crop of fruit the following year. At winter pruning all excessive growth (Fig. 129) is cut off, and only two canes and two spurs left. The canes are tied as seen in fig. 130, and the spurs are left as close as possible to the base of the canes or the top of the old wood.

Fig. 128. A trained graft six months after being inserted

Fig. 133.

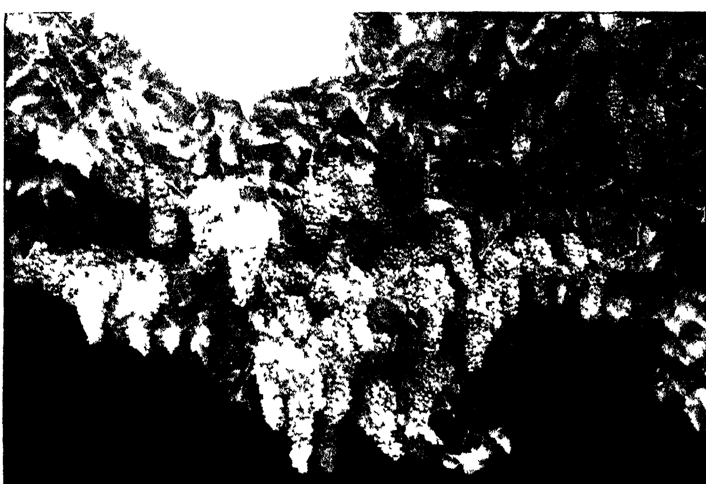


Fig 134.

Fig. 133. Full bearing Sultana vine.
Fig. 134. Thompson's Seedless in full bearing after same system of pruning.

The following year these long canes will bear the fruit and the short ones will throw out shoots, two of which should be allowed to grow to a good length ; all other shoots to be pinched back during the summer, so as to throw a good growth into the canes which are to carry the crop the ensuing year, and at each winter's pruning the previous year's fruiting wood is completely cut away, and two new canes and spurs left as heretofore described.

If the vines are exceptionally strong, either two extra canes may be left or the two which are left may be of greater length ; the length of the canes to be decided by the strength of the vine, which will vary, and by the size of the crop which it is thought it can bring to maturity. Thus, in a climate where the summers are very hot, with but little if any rain, the canes should not exceed in length from 3 feet 6 inches

Fig. 135

to 4 feet 6 inches, while if grown on good soil and with irrigation they may be left from 5 to 6 feet long, or it may be found advisable to leave two or three canes of 2 or 3 feet in length on each side. See Figs. 131–2.

This is another system of pruning the Sultana, which gives good results, especially where the vines put in exceptionally heavy growth. There are two permanent main arms left, and trained to the bottom wire; three canes of about 3 feet in length are left on either side. The following year these are removed, and young growth again substituted. This is the system followed by many large growers of Sultanas where irrigation is practised. It is simple, and the pruning can be quickly accomplished.

If this vine were to be cut back to two short spurs there would be plenty of growth but very little fruit, as the first few buds next the old wood do not bear fruit, hence the reason for long pruning.

Fig. 135. Showing vineyard after pruning.

Pruning the Zante Currant.

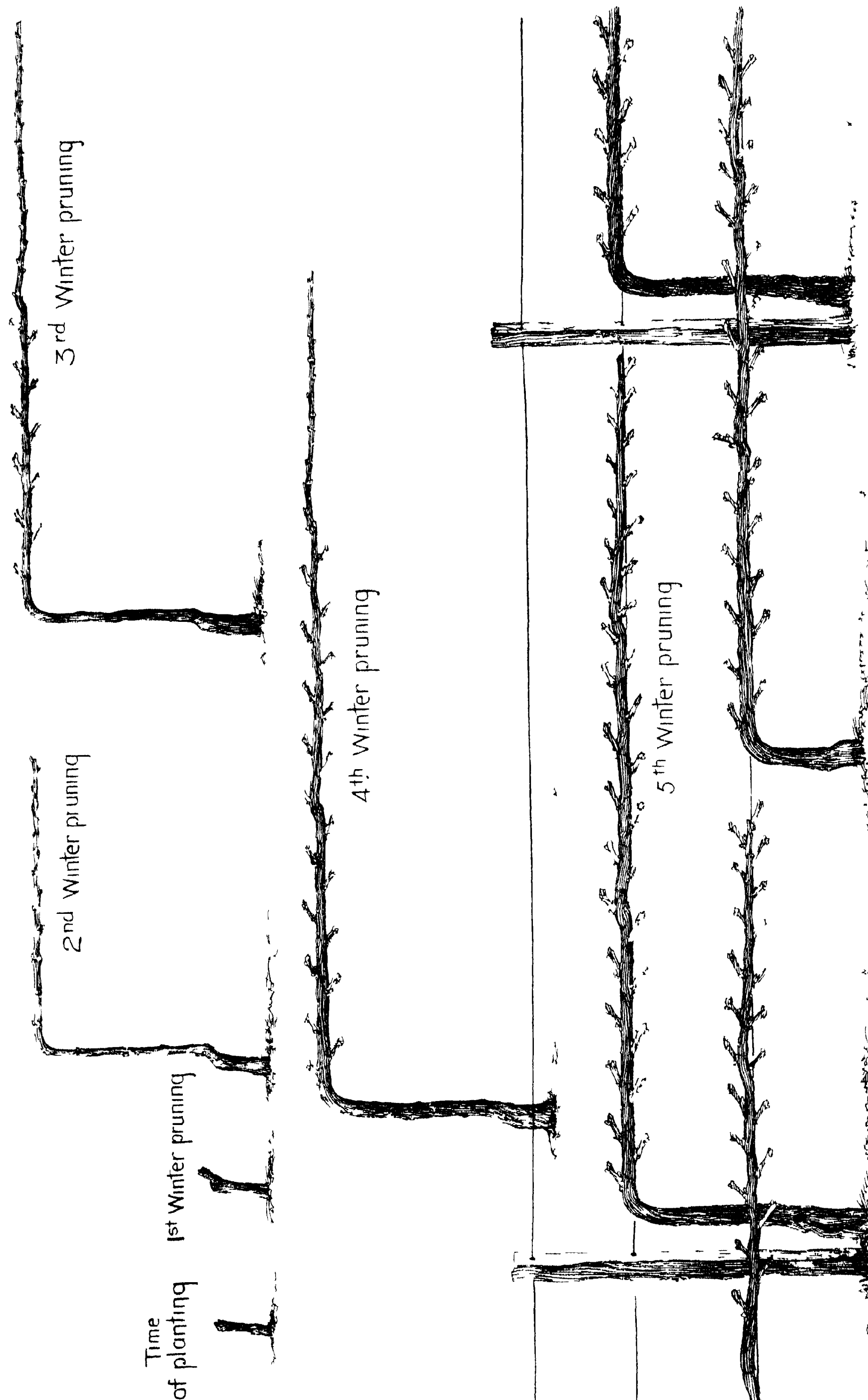
This vine has been growing in different parts of Australia for many years, but as it appeared to be rather a shy and erratic bearer, it did not until lately receive the amount of attention which it deserved, neither was it properly understood.

In South Australia it came more into prominence than in any other State, and, although several methods of pruning were tried with varying success, I do not consider any system is more simple or will give better results than the following, which is simplicity itself, and I have seen 2 tons of dried currants taken from an acre of vines so pruned. Of course, this was an exceptional yield, and the vines which produced such a crop were well cultivated, well manured, and of good age, and planted on land which was being irrigated.

At time of planting the vines are well cut back, as with other varieties, and allowed to grow the first year with but little care beyond disbudding and keeping the growth of the lower portion of the vine confined to one main shoot. The first winter pruning may consist in again cutting back short to the main shoot. The vineyard should now be trellised, and the following summer only one shoot or leader may be allowed to grow, which may be trained to either the first or second wire, to suit the occasion. The second winter's pruning will then consist in cutting off all the laterals close to the main leader, and shortening back the latter to good, sound, and fully-matured wood. See plate (second winter's pruning). At the time of the third winter's pruning the main leader will have extended a little further, and spurs containing three or four buds left on the older portion of same at distances of about 8 or 9 inches apart. See plate (third winter's pruning). The same system is followed from year to year (see fourth and fifth year's pruning), always leaving good, strong spurs. The length of the leader will depend on the strength of the vine, and on the distance apart at which the vines are planted.

The rows of vines should not be less than 10 feet apart, and in districts where the vines put on a strong growth, they should be at least 12 feet apart in the rows; then each alternate vine is trained to the lower and second wire respectively, as shown in fifth winter pruning.

There has been considerable discussion as to whether ringing the vine at the time of blooming will guarantee a better set of fruit, as well as producing fruit of better size. Many of the currant-growers at Mildura have tried this method, but have not been very favourably impressed with it. In South Australia it has been tried with varying degrees of success, and at our Wagga Experiment Vineyard we have been carrying on this work, the first vines being rung by Mr. Hogg, the orchardist there, some three years ago, since which time a good number of vines have been treated from year to year, and while we have both given the subject considerable attention, we are not yet in a position to say whether it will have any detrimental effect on the vine or not. Up to the present, however, it does not appear to have weakened the vines, while, on the other hand, it has been the means of increasing the yield considerably.



PRUNING OF THE ZANTE CURRANT

It will be observed that the system of trellising, which I here recommend, is the three-wire trellis, which I consider all that is desirable for the Zante Currant vine. I may say that at our Wagga Vineyard we have the T-shaped trellis, but, so far as I can see, it has not, up to the present time, given any better results than the ordinary three-wire trellis before described.

Mr. Thos. Hardy, of South Australia, differs from me on this point, and in his article on the Currant Vine, published in the *Garden and Field* some years back, says: "The greatest improvement made in the cultivation of the currant vine of late years has been in the method of trellising. It was very early found that, grown and pruned like other vines, very few grapes were got from them; also that they did much better where trellised, so that the fruit hung clear of the foliage, and wherever the fruit was too much enclosed by luxuriant foliage (as often happened in an ordinary trellis), that plenty of

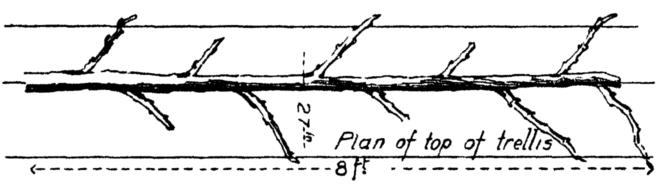


Fig. 136.

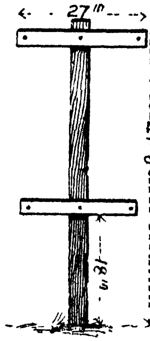


Fig. 135.

bunches formed, but very few set their fruit." After trying several styles of trellis, Mr. Hardy has finally adopted a double trellis, as shown in Fig. 135, the object being to get more room for training the vine. The method of pruning and training the vine is shown in Fig. 136. The greater number of spurs are pruned to five or six buds, but here and there rods are left long enough to reach the outer wires, to which they are tied to keep the vine firm. The spurs are found to bear as well as the rods, only enough of the latter being, therefore, left to steady the vine.

The Gordo Blanco or Muscat of Alexandria.

This grape is grown extensively here as a dessert fruit, and in many districts does exceptionally well, as, although it is our best grape for raisin-making, it is of very little value for this purpose unless grown on some of our light soils in the interior, or very warm climates, usually under irrigation.

If a rooted vine is planted the top should be cut back to a height of 9 to 12 inches from the ground, but if this cannot be attained it may be cut back short, and one of the strongest shoots selected out

and allowed to remain, while the others are rubbed off. This may be tied to a stake, so as to keep it upright, either now or after the first winter's pruning, as it is most desirable to have all the vines as well balanced as possible. Nothing looks worse than a vineyard with vines starting in every direction, and there is nothing harder to work than such a vineyard.

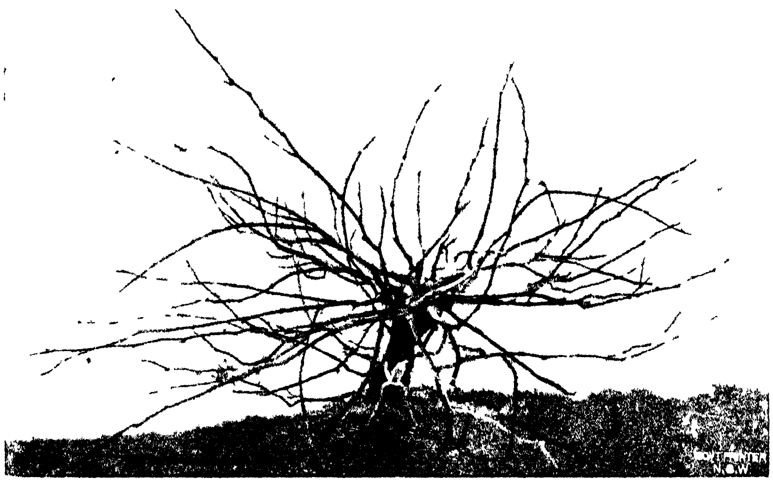


Fig. 137

Fig. 137 is a vine six years old before pruning.

Fig. 138 is the same vine pruned.

Fig. 138.

At the first winter's pruning the vine is cut back to a stem 9 to 12 inches high, leaving three spurs radiating around the top of the vine. The crown of the vine should always be kept compact, and the bearing shoots should radiate around same just as the spokes of a wheel do around the hub, and as years go by the shoots should be cut close back to this crown or hub, always leaving them well placed around same, and if the vine does well the third season about six spurs with two buds on each may be left, and from this on the number of spurs will vary according to the strength of the vine. Some may never be strong enough to carry more than six, others eight, and the strongest may have ten short spurs at the most. Under no consideration would I recommend trellising or leaving long spurs on this vine, as, if allowed to carry too much fruit, the quality will be very inferior, and of little value. This applies more particularly to our warmer climates.

In our moist coastal climates it may be found advantageous to raise the crown of the vine up to 15 inches, and allow the crown of the vine to spread a little, so that the fruit will not hang in too compact

Fig. 139.

clusters, thus keeping out the sun and light, and, in consequence, leaving them a more ready prey to oïdium. In the interior, however, I could not recommend this latter course.

Fig. 139, vine bearing fruit.

The Orange and Mandarin.

In Australia, where ninety-nine per cent. of the citrus trees are removed from the nursery to the orchard without being balled—that is, dug in such a manner as to leave a ball of earth adhering to the roots,—it is very essential that they should be well thinned back at the time of planting, as the removal of the tree is in itself a considerable set-back, and especially so wherever the roots are allowed to become exposed to the air, to say nothing of the drying winds and hot sun which some careless planters subject them to.

Fig. 140.

With these, as with other trees, I am a great believer in the system of cutting well back at the time of planting, as trees so treated recover from the removal more quickly; and further, in place of having a slim slender stem or trunk we have a good sturdy strong one.

Fig. 141.

In treating with the removal of young orange trees from the nursery, I will include also lemon trees, so as to save any reference to this part of the work later on. Figs. 140–1 show two young citrus trees in the nursery large enough to be planted out in orchard form. Figs. 142–3 show the different methods of removing trees from the nursery to the orchard. Fig. 142 shows the method of balling the roots — that is, by allowing a round ball of soil to remain on the roots and the tree planted in the orchard with the ball still adhering to it. This method is largely adopted in California, where trees are grown within a few miles of the place where they are

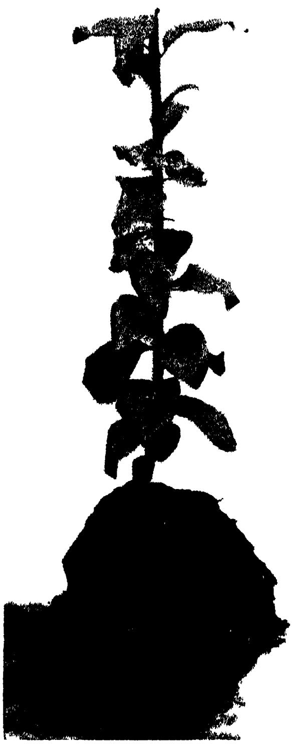


Fig 142

to be planted Trees so moved are not liable to suffer much from the removal. The method usually followed here is shown in Fig 143, which is a young tree taken from the nursery without allowing

Fig 14

any soil to remain on its roots This system of removal can be carried out with great success if reasonable care is exercised to prevent the roots becoming exposed and dried

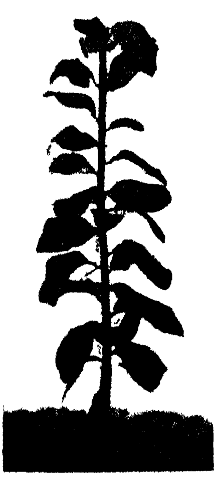


Fig 144

Figs 144–5 shows respectively a young lemon and a young orange tree after being planted and pruned to a height of about 30 inches Although one of these trees appears to be higher than the other, it is really not so, this effect being due merely to the fact that in the one the camera was placed closer to the tree than in the other case

In pruning such a tree as Fig. 146a, I would remove all shoots back to where the lines are drawn; and

Fig 145

wherever the trunk of the small tree is exposed to sun and wind, it should be protected by wrapping hessian loosely about it. If the leaves are allowed to remain on the trunks of the trees, as shown in Figs. 144–6, they will be sufficient protection. Sometimes, however, these leaves drop at time of transplanting, in which case it is well to protect the trunks in the manner above mentioned.


Fig. 146a.

The orange-tree is naturally an easy tree to shape; but with the exception of the pruning at planting, I would not recommend cutting the young tree very much the first season. The second year any strong-growing limb may be cut back a little, just to keep the tree evenly balanced, and to give strength to the limbs. Any very low limbs may be removed up to a height of 18 inches from the ground, so long as there is a sufficiently good top left to shade the tree. The following year the tree will require just a little attention, the ends of any strong-growing weak limbs or suckers cut back to give them strength, and the suckers, wherever they are not required to fill up a space in the tree removed. At this stage it may be advisable to thin out any parts in the centre of the tree where it may be inclined to grow too thickly. In following years it will be found that certain limbs may become misplaced, and that some of the lower branches are becoming too low. In such cases these branches must be removed.

Each spring or summer all dead wood should be removed from the tree, which should be preserved in a compact wall of foliage of symmetrical and convenient form. In pruning the trees, all thorns should be regularly removed from the inside of the tree, so that the limbs will present a smooth surface, and that fruit found growing towards the inside of the tree may be picked from the inside if necessary, or the tree sprayed without hindrance. The lower branches of the tree should be kept cut back, so that the fruit will not hang on the ground. The fruit found growing low down on any tree is more easily picked, and less susceptible to damage by winds, than that hanging high up on the tree; consequently, it is well to encourage the production of fruit almost to the ground.

In the following illustrations are some fairly well-shaped orange and mandarin trees.

Fig. 146 is a four-year old orange-tree, after pruning.

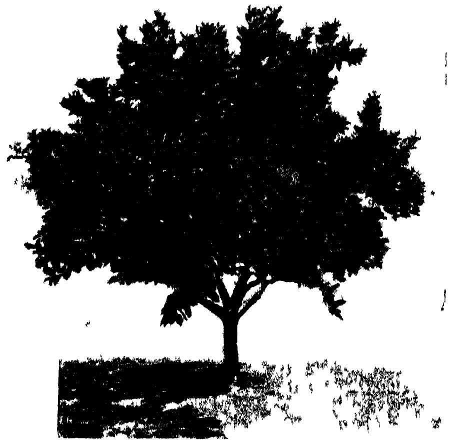


Fig 146

Fig 147

Fig 147 is a five-year-old tree before pruning

Fig 148 is a well-shaped "scarlet" mandarin-tree.

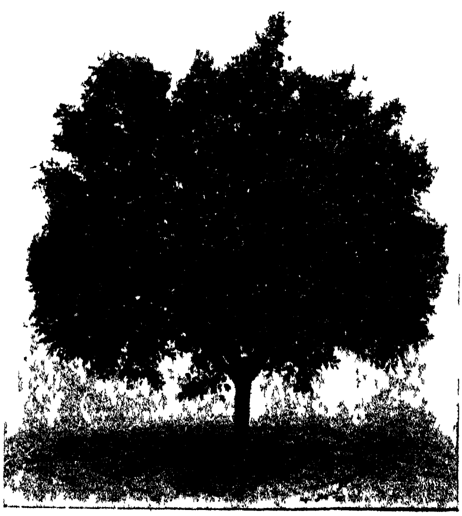


Fig 148

Fig. 149 is a well-shaped mandarin-tree of the thorny variety.

Fig. 149.

Fig. 150 is that of a forty-year-old seedling orange-tree, which is growing in the orchard of Mr. Schwebel, at Glenorie, and carrying good crops of fruit; still, although it is a little open in one or two places, it is yet a very good shape.

Fig 150

The Lemon.

The pruning of the lemon should start at the time of planting, when the tree is cut back in order to give a good strong foundation. As this tree always throws out longer and more slender growth than the orange, it will, in consequence, require more constant attention to keep it in good bearing condition. For the first few years our aim should be to produce a good strong tree, and to obtain this end all straggling growth will have to be cut back every year and the tree thinned out, arranging the branches so that they will not be too close together. Cutting the branches back in this way will so strengthen them that they will be able to hold a good crop of fruit.

Trees properly pruned will throw out numerous short laterals, and the fruit will be borne more in the centre of the tree, where there is less danger of its weight breaking the branches, and where there is less danger of its being blown about and damaged by winds. It is very noticeable that the best lemons are found around the centre and

bottom of the tree. The system which, of late, is finding considerable favour with the growers of California is that of the low open head.

Fig. 151.

The tree is allowed to spread to a good width, but is never allowed to attain a height of more than from 6 to 9 feet. It is claimed that by following this method the fruit is borne where it is not damaged by winds, that the tree bears well, and that trees which never bore well

Fig. 152.

while allowed to grow to a height of 12 or 15 feet have, since being cut down to 8 feet, borne regular crops of fruit. Trees so pruned can be more easily sprayed or fumigated, and at a much less expense, and

the fruit is more easily picked. It will, therefore, be seen that it has much to commend it.

Fig. 151 is a tree which is about 14 feet in height, and on the top 6 feet very few good lemons grow, as the winds usually whip them around, and spoil the few which set; consequently, I have cut out about 6 feet from the top, comprising the perpendicular branches, which were severed at their juncture with the horizontal branches.

Fig. 152 is the same tree after pruning. Although this is not cut back so severely as is recommended by followers of the Baronio system, still it is modified to meet our requirements; and I think that many trees could be greatly improved by having a considerable part of the

Fig. 153.]

long willowy tops removed just where they join a horizontal branch. I know that many of the old growers will say that by cutting an old tree you will kill it; but I would ask them just to try a few trees, and I feel sure they will be rather agreeably disappointed to find that the trees will not only live through the ordeal, but will be greatly benefited by the treatment. After a tree has been cut back, it will throw out many young shoots. These should not be thinned out until they attain a good size, as some of them are fruiting twigs, which will never grow very long, while others will be found to make a much stronger growth. These latter should be removed, and the smaller ones allowed to remain.

Fig. 153 illustrates the Baronio system of training the lemon, as described in the Year-book of the United States Department of Agriculture, 1900.

[*To be continued.*]

HAWKESBURY AGRICULTURAL COLLEGE AND EXPERIMENTAL FARM.

SILO CONSTRUCTION AT THE HAWKESBURY AGRICULTURAL COLLEGE UP TO DATE.

A. BROOKS.

THE absolute need of providing storage room for winter feed for their cattle has perhaps never been more severely felt by our dairy farmers than it is this present winter, when every class of fodder is at famine prices. Many tons of first-class ensilage could have been stored when last season's corn crop began to suffer for want of rain (and it was quite evident that it would yield little or no maize in the cob) if more silos had been constructed. To be able to cut down a crop and chaff it into a silo where it can be stored for months and used just as it is required is a convenience that no dairy farmer should be without, for besides providing a safe storage for the crop it has been proved that good ensilage gives better results in the milk-pail than the usual winter feed otherwise available. To enable the dairy farmer to preserve his feed crop with all its succulent juices rendered more digestible and nutritious, he requires the best, most convenient, and strongly-built silo he can get; and, as I have made it an especial study to design one that would have these qualifications and be suitable to our climate and not too costly, I give the results of my efforts during the past eight years in silo construction, together with complete plans, details, and instructions how to build, trusting that it may be beneficial to those who contemplate erecting a silo.

The construction of the silo has undergone many changes here as elsewhere, the first silage being made in a pit scooped out of a corner of the paddock where the crop grew, and covered over with earth to provide pressure to exclude the air. This made fairly good silage, but, being uncut, it was difficult to handle and unprofitable to feed with. The following year, 1894, we constructed our underground pit silos, 40 ft. x 12 ft. x 15 ft. deep, divided into two, each 20 feet long. These were strongly timber-lined with upright ironbark planks, 2½ inches thick, secured to heavy framework to withstand the pressure both from the loose ground they were excavated out of and the ensilage

when full. The excavation was about 11 feet deep, 4 feet being over the surface of the ground, banked up as shown in Fig. 1.

To keep back any soakage, a 6-inch drain was laid 7 feet deep all round, and a clay puddle placed against the planks. The roof was semi-circular, and continued over the ends to provide cover for the drays when being loaded, and each pit was provided with heavy chains, anchored to bottom logs, and brought up through the silage to the

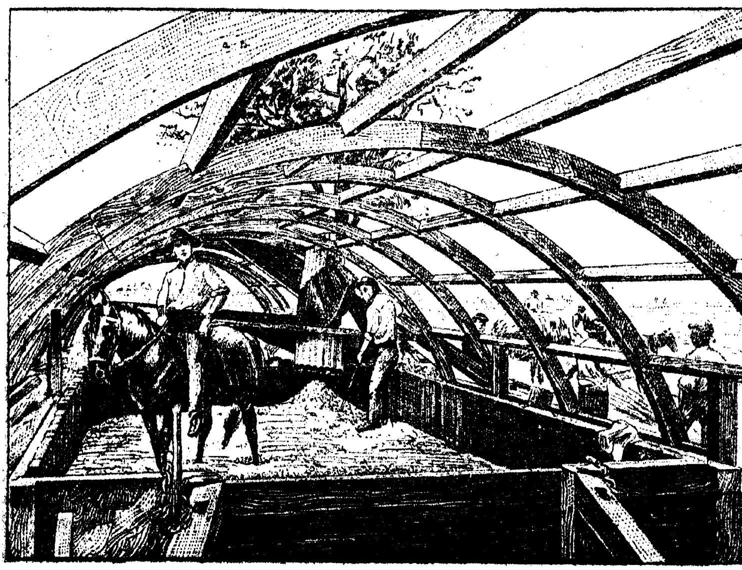


Fig. 1.—Underground silos at H. A. College.

top over transverse beams laid across top decking, and pulled together by double-ended screw ratchets which pressed the whole down. A carrier on T-iron rails, hung under the crown of the roof, served to take the bags of ensilage to the drays at each end.

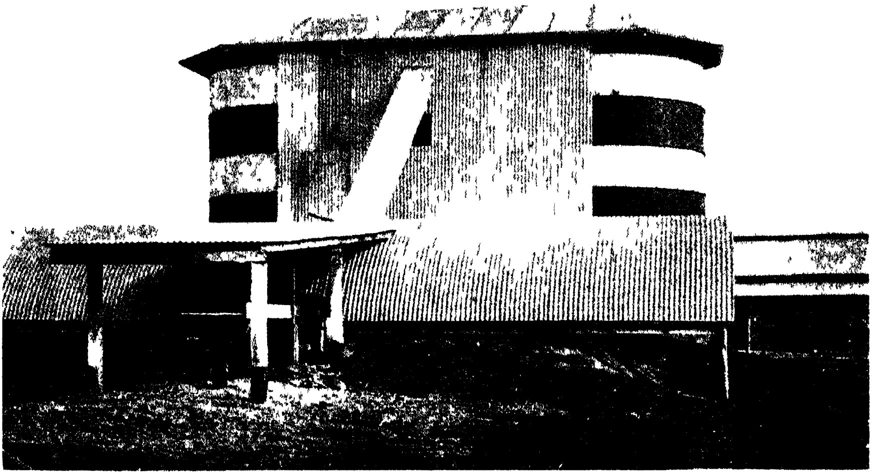
The cost of constructing these pits was equal to about £2 per ton of capacity. No doubt they are strong and will last a lifetime, but we have proved they are not the best, although the most expensive.

In 1897 I designed a small silo, which any handy man could construct with materials that would not cost more than £7, and although we did not build one this size here, I heard from a farmer who did build one that it gave every satisfaction.

The 100-ton Tub Silo.

The same ideas of construction applies to this one of 100-ton capacity, the first we erected at this College, the cost of which was £35, labour and materials included, equal to only 7s. per ton, a price within the reach of any dairy farmer. It was built to the design given for the small tub silo above mentioned, that is, the planks were

The first Tub Silo, of 100 tons capacity.



Twin Silo in present use. The elevator for filling is shown. The chaff cutter is located in the shed in the foreground. The semi circular iron roof covers the pit silos, which have been in use for several years.

square on the edges (not tongued and grooved), and the doors cut out of the wall planks, and directly over each other. This, in such a large silo, proved to be a weakness when it stood empty, as the doors were left open, and being on the westerly side, the hot summer winds told very much on the joints. This defect suggested to me the idea of the door frame, which now proves to be not only a great convenience, but also a strong feature in the construction. The door planks are now fitted in such a way that they need not be left at the bottom of the silo when empty, but can be placed in their respective openings as you pass downwards when emptying the silo.

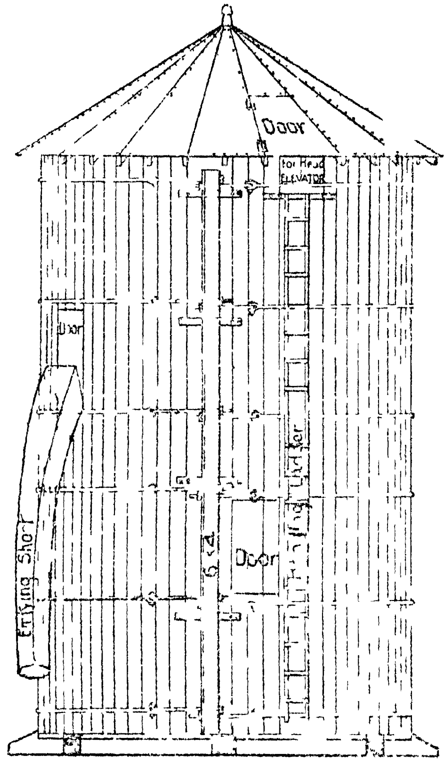


Fig. 2 —Single 100 ton tub silo at H. A College.

Where to place the Silo.

Undoubtedly the silo should be as handy to the bails as circumstances will allow, so that feeding may be carried on with the least possible amount of labour. Should the dairy farmer be building both bails and silos, and can find a steep bank in a convenient position, he may place the lower part of the silo into the face of the rising ground, and have bails running out from it, thus :—

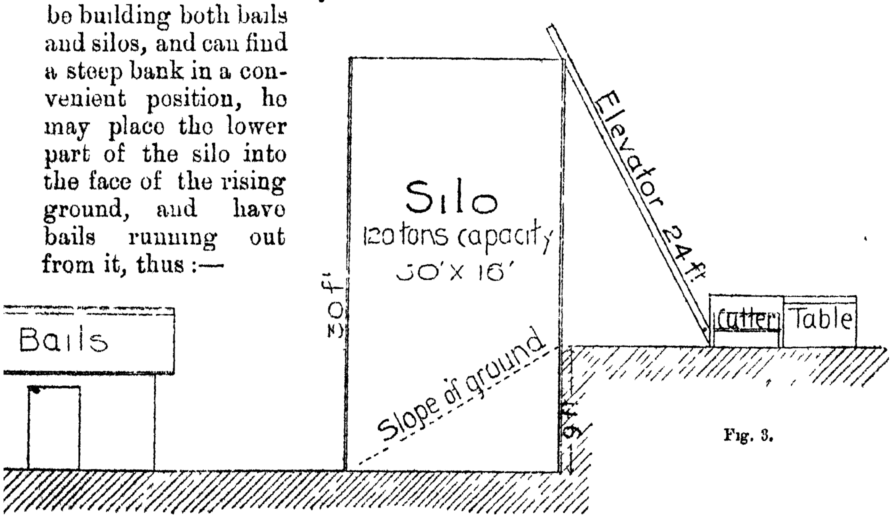


Fig. 3.

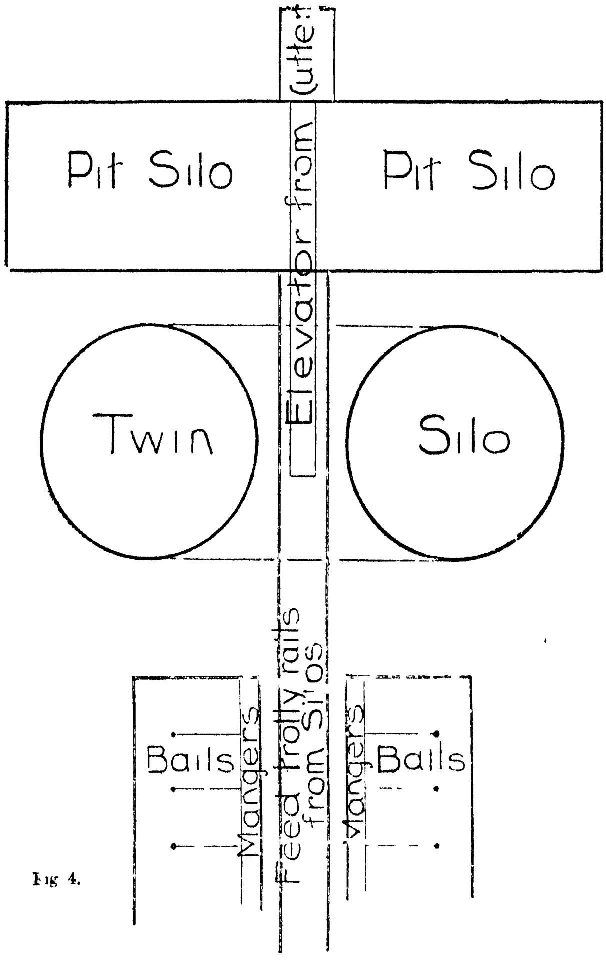


Fig 4.

The advantage of such a position would be that a comparatively short elevator would serve to fill a deep silo, and that would be an immense saving to the man with limited machine power at his disposal. Unfortunately here we have no such positions, our ground being so very flat throughout. The ground plan given, Fig. 4, will show our arrangement, which proves to be most convenient and handy in every way. The cutter and elevator are permanently placed, so that both under and overground silos are filled from the one position.

The engine is brought up behind the cutter, and is not removed until all four silos are filled. There is line of rails through the centre of the bails, extending from silos to the milk hoist, so that with the one truck we take the feed to the cows, and the milk to the factory.

In any position the silo walls must be protected from rain or surface-water about the foundation, as nothing tends to decay timber so much as standing where it may be wet and dry alternately. Fig. 5 shows how the earth on a slope should be excavated to provide for a suitable situation for a silo. (See Fig 3.)

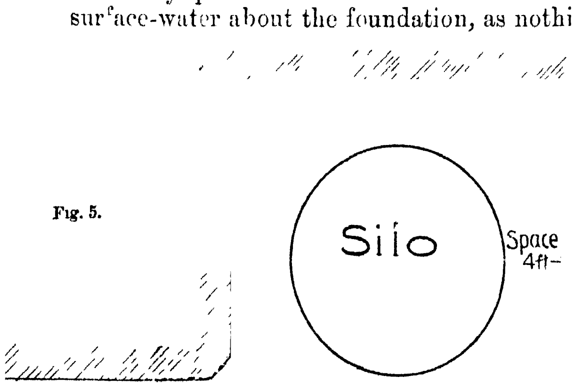


Fig. 5.

Filling and Emptying the Silo.

The most frequent objection we hear made to the overground silo is the expense of filling, requiring extra power, and length of elevator, according to the height of the silo over the ground the cutter stands on. No one denies the necessity to cut up the fodder if it is to be profitably used, therefore we may say that the elevator is the only part of the machinery that requires to be added to, as the driving power and cutter will already be on hand.

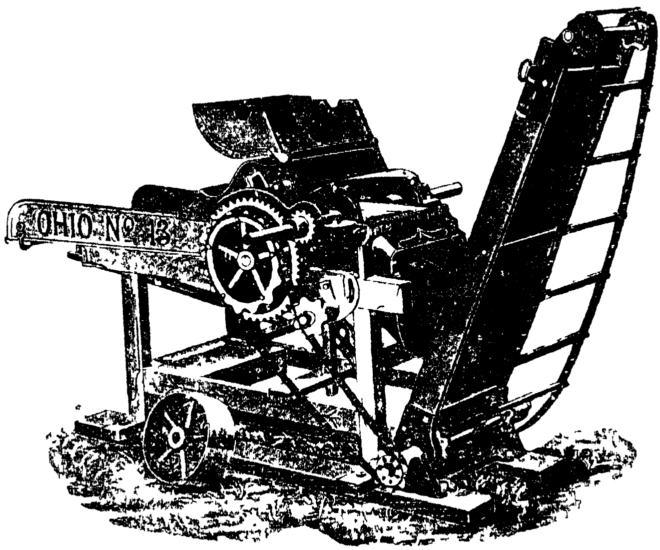


Fig. 6. Cutter and elevator in use at H. A. College.

These cutters, with 12 feet of elevator attached, can be purchased for £20, and when we required to increase the length of our elevator to 28 feet to fill our first overground silo, I had to do it with what chain-belting and fittings were on the short elevator, because others of the same pattern could not be had in Sydney at that time.

The short elevator supplied with the machine is worked with a chain-belt on each end of the carriers, so my only chance to make extra length of elevator was to try the single belt. The greatest trouble I had was to make a carrier sufficiently strong, as the shape of the metal ends of the original carriers was suitable only for the ends, and I wanted them in the centre. However, there is no need to make shift with these now, as a suitable fitting can be had from the Ewart Manufacturing Co., 22 Clarence-street, Sydney, where every requisite for chain-belt gear may be obtained. These fittings are shown in Figs. 7 and 8, p. 964. The carrier itself must not be heavy, as that adds to the strain on the machinery, so I make them of any light pine or cedar, and fix them with screws. The box they run in should be made in handy lengths, spliced together, and fastened with bolts

flush on the inside. It requires to be made $15\frac{1}{4}$ inches wide x 3 inches deep, as shown on section of elevator box, Fig. 9. The full length of the carriers is 15 inches x $2\frac{1}{2}$ inches wide, out of 1 inch stuff, bevelled to $\frac{3}{8}$ inch on top edge like a weatherboard, and they are at about 9-inch centres, or every seventh link in the belt. They run over one sprocket wheel at top and bottom of the elevator, which is driven by the side sprockets on the machine. For the single silo, a slanting board or sheet of iron should be placed under the roof in such a position that the silage will fall on it from the elevator and scatter over a wider area of surface, while, for the twin silo, we have a distributing saddle shoot, Fig. 10, the top part of which is so hinged that you can deliver the stuff into either silo.

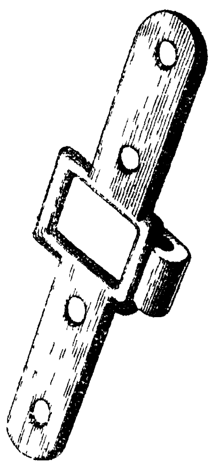


Fig 7 For centre

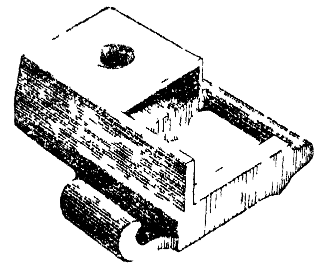


Fig 8—For ends

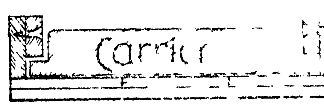


Fig 9—Section of elevator box

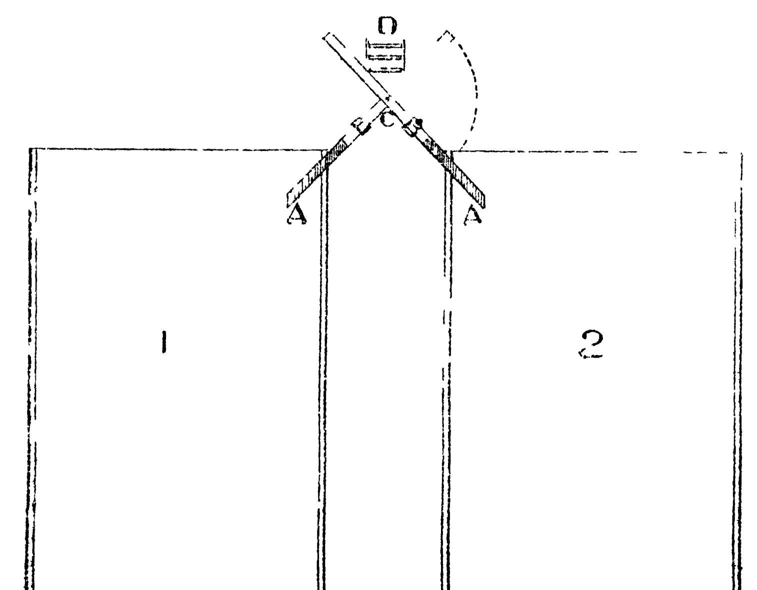


Fig. 10.—Saddle shoot for twin silo 1 and 2 are the silos, A A, fixed ends of the shoots, B, shoot in position delivering into silo 2, C, pivot, D, head of elevator delivering into shoot, E, portion of shoot pivoted at C

This is a distinct advantage, as you can partly fill and allow to settle down into each silo alternately, and thus pack the stuff quite solidly from bottom to top.

Packing the Silo as it fills.

The proper tramping down, most especially around the sides of the silo whilst filling is going on, cannot be too strongly impressed on all who are using silos for profit. I have seen this practically illustrated, and it was not surprising to find a few inches thick all round in the upper half unfit for feeding with.

Silo badly packed.

The illustration, Fig. 11, shows exactly what takes place; the deadweight in the centre draws the sides inwards from the walls, leaving a distinct air-space. And not only do you not get the quality, but you do not get the quantity, the top half panning out only about half the weight you will get in the lower half. It is more important that the tramping should be done in the top half of the depth of the silo, because the distance the stuff has to fall from the head of the elevator is reduced, and there is not the deadweight of itself to sink it. Indeed, it is all the better to continue the tramping for a few days after filling, and before any covering is put on. When this is faithfully done the quantity of feed saved will well repay the extra trouble.

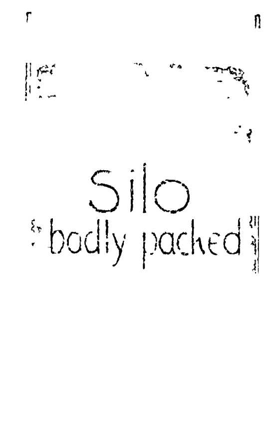


Fig. 11.

Emptying the Silo.

The silo being constructed as herein described, there is no better and easier way of delivering its contents into the bags or the cart than by the "sleeve shoot," shown on the picture of the first overground silo erected here (see page 961), which is simply made with corn-sacks opened out at the bottoms and sewn together endways, the top cut off slanting and secured to a leather webbing, which is sewn over the iron frame, Fig. 12.

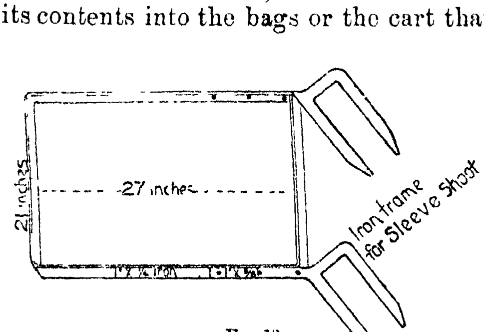


Fig. 12.

The legs of this frame fit loosely over both sides of the rails of the door-frame, the open mouth of the shoot leaning outwards, so that the

silage can be easily thrown in off the fork. The shoot is made long enough to serve from the highest door, and to shorten it you simply fold it up from the bottom end to the required length. A ring with spikes may be used over the mouth to hang the bags to if desired; but it is handier without the ring if there is one man at the bags and another in the silo. If delivering the silage into a dray loosely one man would be sufficient to do the work. The iron frame should not be more than 21 inches, to set into the 24-inch door-opening, as allowance has to be made for the thickness of the nuts on the ends of hoops where they are close to top edge of the rails. For the twin, or double silo, we have a more elaborate shoot, constructed with 1-inch boards fixed to 3-inch by 2-inch cross rails, as shown in Fig. 13.

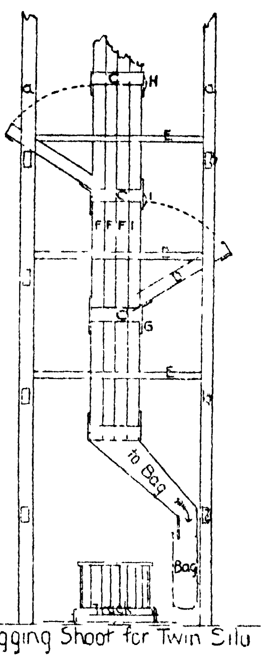


Fig. 13. *a a*, styles of door frames; *b*, rails of frames, *c c*, 1" ledges; D, door opened out, E, 3" x 2" cross rails; F F, t. and g. boarding, forming flue.

Shoot for Twin Silo.

It will be seen that this is simply an upright flue, with doors fitted into the two sides facing the doors of the silos, and so arranged that when they are opened out they fall into the door-opening and slant downwards, and being three-sided, each door forms a side-shoot into the upright flue, delivering into the bag at the mouth on one side of the trolly-track. The inside face of this shoot is free from any ledges or other obstruction to the free passage of the silage. All ledges and cross-fixings required are on the outer faces.

Circular v. other plans for Silos.

There is no question but that the circular plan is the best, there being no corners to trouble about as is the case with other forms of silos; and it should be above ground, because, as we have already shown, it is and can be made just as perfect, and a great deal more convenient. The only argument that can be reasonably advanced in favour of the pit silo is that it is easier to fill, but what about emptying it?

Filling is usually done with in a few days, but emptying is an every-day—and that twice a day—task for months. The silo, to be a good one, must be strong and practically air-tight, and this can be provided overground constructed with timber. Undoubtedly it requires to be built in a thorough and workmanlike manner, all joints being well made, in the way shown or herein described. Some who might not be particular as to the cost may ask would it not be better to build one

of brick and cement? My answer is certainly not, as the risk of faulty workmanship and consequent cracking of the walls, which would be beyond repair, would be much greater than is the case with the wooden silo.

Of course, if desired, the wooden silo can be made a much heavier structure to do without the iron hoops; but why increase the cost of the silo simply to use more timber.

A few Points to remember.

That the silo, if it is to be a good one, must not have too much surface area; that it cannot be too deep; that it must be properly jointed together, so that it will exclude the air from all sides; that it must be strong; and last, and not least, that it must be convenient.

First, we say it must not have too much surface area, because the silo will pack together much closer and exclude the air better. There will be less exposed surface to spoil if only slow feeding is carried on. It should not have more than 250 square feet surface area.

Then it cannot be too deep, the deeper the better, as there will be more per cubic foot of first-class stuff to take out in case of any careless filling.

As to the other points, no doubt need be felt if the directions here given for the construction be properly carried out.

Size to build the Silo.

With regard to the capacity of the circular silo, it is said that the quantity to be taken out varies very much according to the amount of succulence, moisture, or water there is in the crop when it is put in.

The weight of a cubic foot of good silage in the silo is about 35 lb., and undoubtedly this will be the case with the exception of, say, 4 feet from the top, if it is properly trampled down when filling, but if this be neglected you may get to within 4 feet of the bottom before you get the 35 lb. per foot.

The following table of approximate capacity will afford a good idea of what size to build:—

Height.	Surface area.	Capacity in tons.
20 feet	60 feet	20
24	100	35
30	100	45
24	150	50
30	150	65
30	200	90
25	250	100
30	250	120

Materials to build the Silo.

We have concluded that wood is the best material to use, and it should be as light as may be consistent with the strength required. Although we have in all dairying districts abundance of timber, unfortunately it is not to be had sufficiently well-seasoned to build silos with. There are over 4,000 superficial feet of sawn timber in a 100-ton silo, and of this, 3,600 must be well-seasoned stuff.

Of the suitable kinds of timber imported, there is none more suitable for this purpose than Oregon pine. It should be straight, close-grained, and free from large and loose knots, and the whole, excepting that used for the roof, should be dressed. The hoops should be of thoroughly reliable iron, not less than ¾ inch round, made in 9-foot lengths (about), and carefully fitted at the joints (see plan).

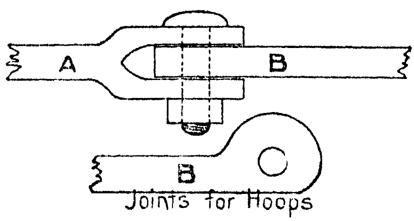


Fig. 14. - Plan of hoop-joints used in College silos.

The roof for a single silo should be octagonal-shaped; the best covering is 2-ply P.B. ruberoid laid on close boarding. It makes a neat job, and will last a lifetime with the help of a coat of paint occasionally. Our first overground silo was built with undressed timber, the planks square on the edges (not grooved), and we had to line the inside with P. and B. paper every time it was filled, which cost about £1. It is now one of the twin silos re-erected with the door-frame, but still plain joints, while the planks of the other are all dressed, bevelled on the joints, to fit close both sides, and tongued and grooved. This is a vast improvement, makes a stronger job, air-tight, requiring no paper lining, thus the extra cost for the timber will soon be repaid, as no paper is required, except a strip over the doors. For the foundation, ironbark logs 12 inches diameter should be used, with 3-inch thick slabs for kerbing. The door-frame should also be of hardwood, if it is possible to get it fairly dry.

List of quantities and sizes of materials required to build a 100-ton silo.

	2 logs, 20 feet long, x 12 inches diameter.
FOUNDATION	4 ,, 10 ,, x 12 ,,
	8 kerbing pieces, 7 feet long, 9 inches x 3 inches, sawn stuff.
	2 side pieces or styles, 25 feet long, 6 inches x 5 inches } H.W. if dry.
DOORS AND FRAMES	5 cross-rails, 2 ft. 10 in. long x 8 inches x 3½ inches } H.W. if dry.
	20 door-planks, 4 ft. 3 in. long x 8 inches x 2½ inches, Oregon.
	74 wall-planks, 25 feet 8 inches x 2½ inches, dressed, jointed, and grooved for 1¼ inch x ½ inch slip tongues.
	74 slip tongues, for do., 1⅛ inch x ½ inch.
WALLS	8 ¾-inch round-iron hoops, 49 feet long, made in 9 feet lengths (about).
	136 3-inch long staples, out of ¼-inch round-iron.
	5 ⅞-inch round double-collared tie-bolts for for door-frame.
	10 plate washers for do. 8 inches long, out of 2¼-inch stock hoop-iron.
	8 pieces 8 feet x 5 inches x 2½ inches, pine wall-plates.
	16 ,, 10 ft. 6 in., and 16 pieces 5 feet x 3 x 2 for rafters.
	350 feet super. 6 x ⅞ boarding.
	60 ,, of 4-inch O.G. guttering.
ROOF	18 brackets for ,,
	24 feet of 2½-inch down-pipe.
	1½ rolls of 2-ply P. and B. ruberoid, with nails, &c., for fixing.
	14 lb. mixed nails.
	Tar, and paint oil and white lead.

Scaffolding.

A reference to the plate showing the first stage of erection, will clearly explain how the scaffolding is provided.

It is around the outside of the silo. The poles or saplings are each set into empty cement casks, and filled around with sand; this makes a good base for them to stand in, and they are so placed around the foundation as to form six sides.

Cross-bearers (or ledges, as they are more commonly called) are lashed to each pole at three different heights, and across the angles thus formed, 1¼-inch thick planks are laid, to be moved about as required.

Cross-braces of 6 inches x ⅞ inch boards (use the roof boarding) are nailed to the poles as shown, and at each crossing, to take the swing out of the scaffold. All the work may be done off this scaffolding, except an occasional hit on the inside face of the planks, which can be done off a ladder.

The following is the material required for the scaffolding :—

6 saplings, 25 feet long.
6 empty casks.
18 ledges, 5 inches x 2 inches, 16 feet long.
6 planks, 9 ,, x 1¼ inch, 15 ,,
36 ropes (plough line), 15 feet long.
Use the roof boards for braces.

Another Scaffolding.

Another scaffolding is required to work on when building the roof, and that is most easily provided by standing an upright pole in the centre of the silo, supporting the centre of two cross-bearers, on which a few short boards may be laid, at about 2 feet from the top of the silo.

A handy Tool.

As you cannot expect to get all the planks quite straight, you will require something in the shape of a cramp to pull them together.

Nothing better for this purpose than a simple ¾-inch round-iron dog, made thus :—

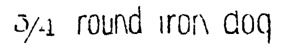


Fig 15

The pointed end turned round 2 inches long, so that you cannot drive it through the planks, and the other end 3 inches long and dumped up on the anvil when being made to make it stronger at that angle to better stand the strain from the wedges. For deep silos two of these cramps are necessary, and should be used on the inside face only if possible, as the holes made will disfigure the silo. This tool may be seen as we used it, in the picture showing the first few planks erected, just over the head of the man on the ladder.

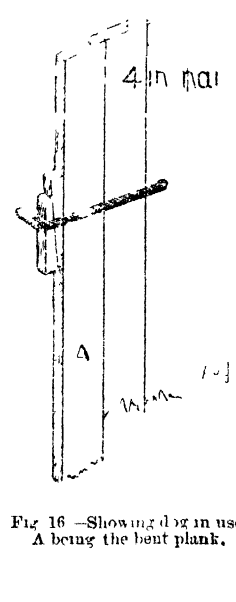


Fig 16 —Showing dog in use, A being the bent plank.

To Build the Silo.

Having the necessary materials on the ground, as specified, you proceed to build as follows (and I will explain here that I desire to make these instructions as simple and practical as possible, not in the way I would give them if I wished them for expert carpenters, but in such a way that the handy-man on the farm, or one with a slight knowledge of carpentry, may be able to follow them, and by this means make the building of the silo more within the reach of our average dairy farmer).

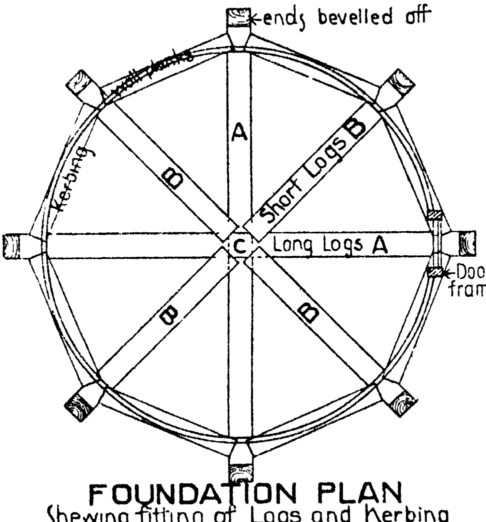


Fig. 17.

If the site chosen is not low and likely to keep water lying about, the foundation may be laid down on the surface. The logs should be all squared on three sides with the axe, the two long ones halved out in the centre to fit at right angles. These are marked A. Next scarf the ends of the short logs B, and fit them into the angles formed by the first two logs, the scarfed ends of these being thus:—

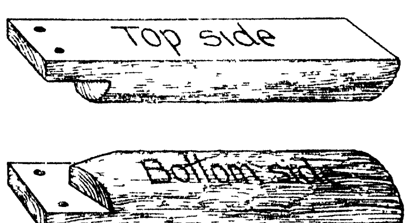


Fig. 18.

All joints and parts lying on the ground should be coated with hot tar before fixing, and the whole set solid and level. Spike well at the joints. The next thing to be done is to mark out the size of the silo on the ends of the foundation logs. This is done with a batten cut off, 8 feet long, for the silo that is 16 feet inside, and with your saw cut a small notch at one end to place against a nail to be firmly pointed in at the centre of the foundation, marked C. With this batten and your pencil plainly mark the inner line that the planks are to stand on, on each log at the outer ends; then again mark each at 18 inches longer, and saw off the spare ends. Slope the ends off with the adze to give it a finished appearance. The circle you marked off first will give the position of the ends of the kerbing pieces on the inner edge, from which you get their lengths, and then mark each in its own place, and notch down flush with the top of the logs. Well tar these on three sides and spike down. The spaces in between and

around these timbers may now be filled in and rammed with any good stiff soil or clay until you form a good bottom for the inside of the silo, and weathering for the outside.

The foundation is now finished.

The Door-frame.

The door-frame requires to be well and carefully put together, the joints all well fitted and painted. Mark out the sides or styles, 6-inch x 5-inch pieces, for mortises to take the five rails, the top one

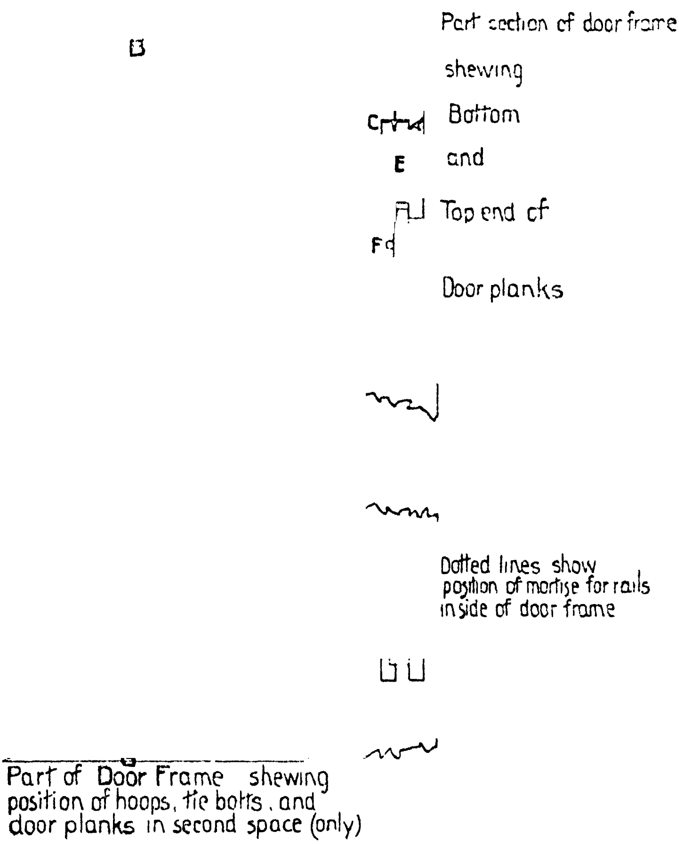


Fig. 19.

being about 9 inches from the ends, and no rail at the bottom, only the 1-inch fillet nailed on kerbing. The distance from under edge of top rail to foundation will be divided into five equal lengths for five doors. The rails may be 3½ inches thick, and as will be seen by the detail drawing, marked B and C, the edges are grooved out in such a way that, although the planks fit loosely, they cannot drop or fall out.

The top edge of the rail, which takes the bottom ends of the door planks, is covered with two strips of ¼-inch flat iron screwed on to protect it against the wear of the feet, as the openings are very handy to pass through while filling or emptying is going on. The door planks, when in position in frame, are flush with the rails inside the silo, and being 1 inch thinner leave 1 inch projection outside. They are also ⅝ inch short on the top, as when placing them it is necessary they should go that distance into the bevelled groove on the top edge of the rail. The groove on the under edge of the rail, and the tongue on the top ends of the door planks, require to be 1 inch deep, so that when they are dropped into the bevelled groove at bottom end they have still at least ½-inch hold at the top, as at E. Now, if care is taken to place the cross tie-bolts of the door-frame, as shown at F, they serve the double purpose of a guide for placing the tops of the planks against when entering the top ends into the grooves, and to take the pressure from the inside.

The tenon on the rails must be as shown by dotted lines at G, and the full section of the rail should be housed into the styles ¾ inch.

The mortises should be straight through (no wedges).

All holes for hoops must be bored through the styles, as shown on plan, at an angle to suit the curve of the silo, and it should be remembered, when making out their position, that the centre ones, say the 2nd, 3rd, and 4th from the bottom, should be the closest together, as that is where the most strain is on the walls. When fitting in the door-planks let them go in easily, and before starting to fill the silo they should be at least ¼ inch apart, as they swell out afterwards. The centre plank in each door may have a grip-notch taken out near the top end on the inside, so that the plank may be lifted out of the bottom rail.

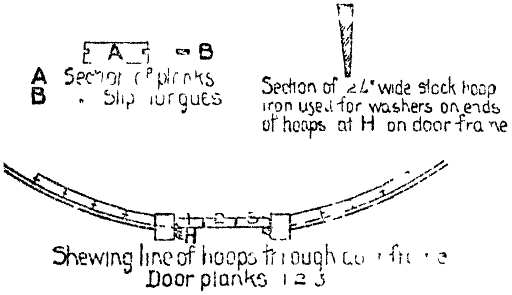
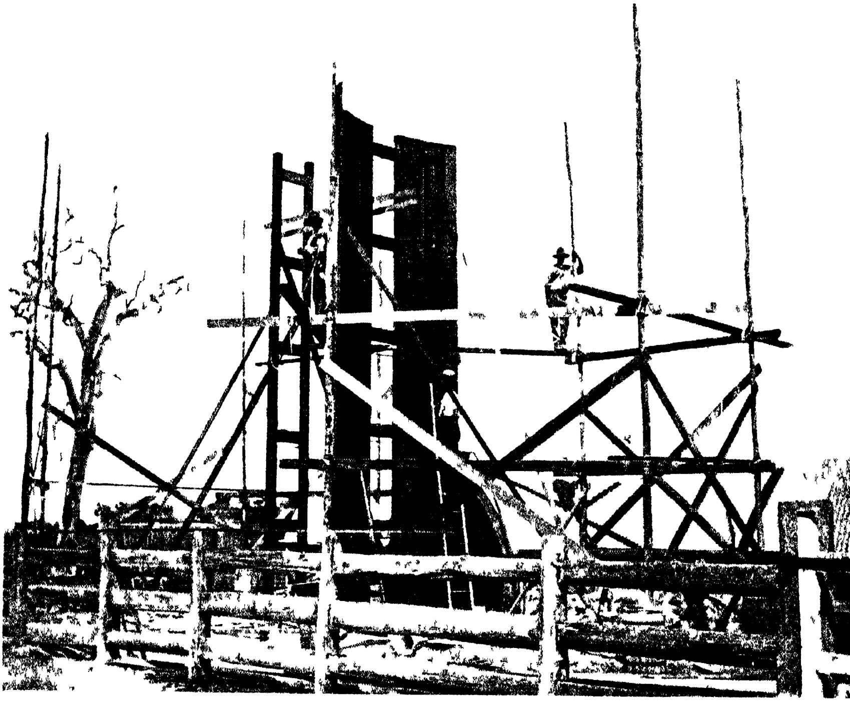


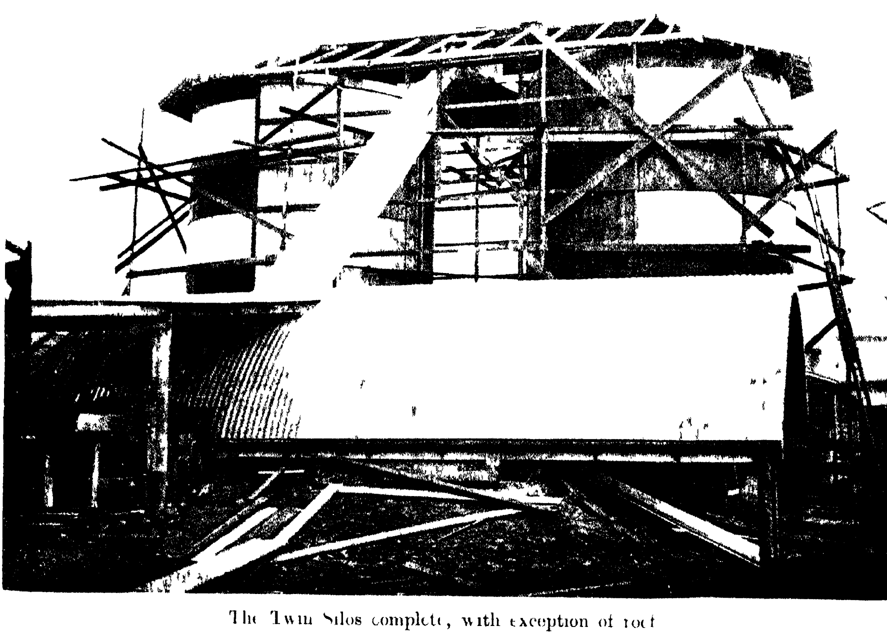
Fig. 20.

Should it prove too tight for this, it may be forced in at the bottom, if carefully done, with a heavy hammer and a piece of hardwood flat against the plank. The position of the styles of the frame may be now marked out on the kerbing, and taken out ¾ inch deep, to take the bottom ends of the styles. We now lay the door-frame aside and build the roof.

Lay out the 5-inch x 2½-inch top plates on the foundation and scarf them together at the angles, forming an octagon, that will be 3 inches over the walls of the silo all round. This allows a curve to be taken out of the inner edge of the plates, to be bolted to the top ends of the wall planks (see Fig. 21). Block up about 9 inches high this top plate off the foundation, and set it level all round on top.



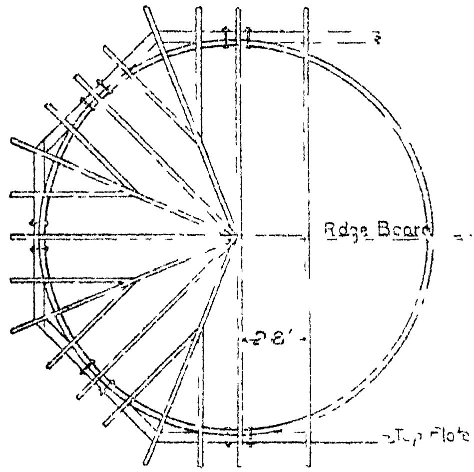
Scaffolding, some planks in position



The Twin Silos complete, with exception of roof

ERECTING TWIN SILOS AT HAWKESBURY AGRICULTURAL COLLEGE

The construction of the octagon roof requires a little skill that may not be found in the amateur carpenter, but if he sets up the full rafters first, and marks out the positions of the others, he will be able to get the bevels of them. Cut and temporarily fix in position every piece of the roof, including the boarding and covering, and carefully mark all for their several places, say from 1 to 8 for the 8 sides, when you can take it to pieces and lay aside until you want to fix it for good.



ROOF PLAN
shewing fixing of Top Plates
Fig. 21.

Setting up the Door-frame.

To raise the door-frame into position, simply take two of the 3-inch x 2-inch pieces you have for stays, and fasten the one end to the inside of the styles near the top with one 5-inch nail, driven not quite up to the head. Place the foot of the frame at the housings prepared for it, and, with one man at the foot, two more can, by means of the stays, push the head of the frame up until it is perpendicular. (*See* plate.) Fix the frame perfectly upright both ways, and firmly secure the bottom ends of the stays to the log foundation. This cannot be too carefully done.

Walls.

We are now ready to fix the planks, and we select a nice straight one for a start, bevelling the edge to fit close against the door-frame, and it must not be forgotten that all joints must be well oiled before putting together. Oil and fix this first plank to the door-frame style with a few 4-inch skew-nails. Fit the tongues into the grooves of a a few more, and go on fixing each to each, using the dog and wedges where necessary. After setting up, say, eight planks, you should hang the plumb-bob from the top and see that the edge and face is perfectly upright, and secure it with one of the 3-inch x 2-inch stays, Fig. 22.

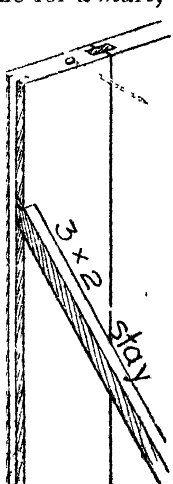


Fig. 22.

These stays are lugged on the top ends, and sunk in flush as far as the tongue in the plank will permit, the bottom ends being secured to the foundation. To remove them when the silo is finished simply cut them through at A, leaving the piece in the plank.

We then set up, say, eight more planks on the other side of the door-frame, and stay them upright; and so on, from alternate sides, until we come to

the last plank, opposite the door. I would recommend that the space for this plank be 1 inch wider at the top than the bottom, and the plank may be in two lengths and driven in tight like a wedge. This can easily be provided for as you work towards the finish.

Fixing the Hoops.

The silo is now ready for the iron bands, which only require to be placed nice and level around, close to the planks, the staples being evenly placed, and the whole screwed tightly up, as tight as you can. Use the hammers on the hoops as you tighten the nuts at the door-frame, to make them lay close. Oil them before fixing in position to prevent rusting.

Oiling the Timber.

As it is not easy to handle timber when oiled, we only put it on such parts as we cannot get to before fixing, leaving all other surfaces until fixed. Now that the door-frame, and all planks and hoops are fixed we want to give a good coat of raw linseed oil to the whole of the silo inside and outside.

Fix up the inside scaffolding previously described, and try the circle of your silo at the top, which can be stayed out or in as the case may be, and when you have it the proper shape bolt on the top plates already prepared. They should fit the silo equally as well on the top as down at the bottom if you have not allowed it to get out of plumb as you went along. Then you are ready for fixing the roof you previously prepared, and which should be very little trouble, being simply to nail together. The brackets for the guttering and the guttering itself, should be all fixed as soon as the first two rows of cover boarding is fixed around the eaves of the roof, then the remainder of the boarding.

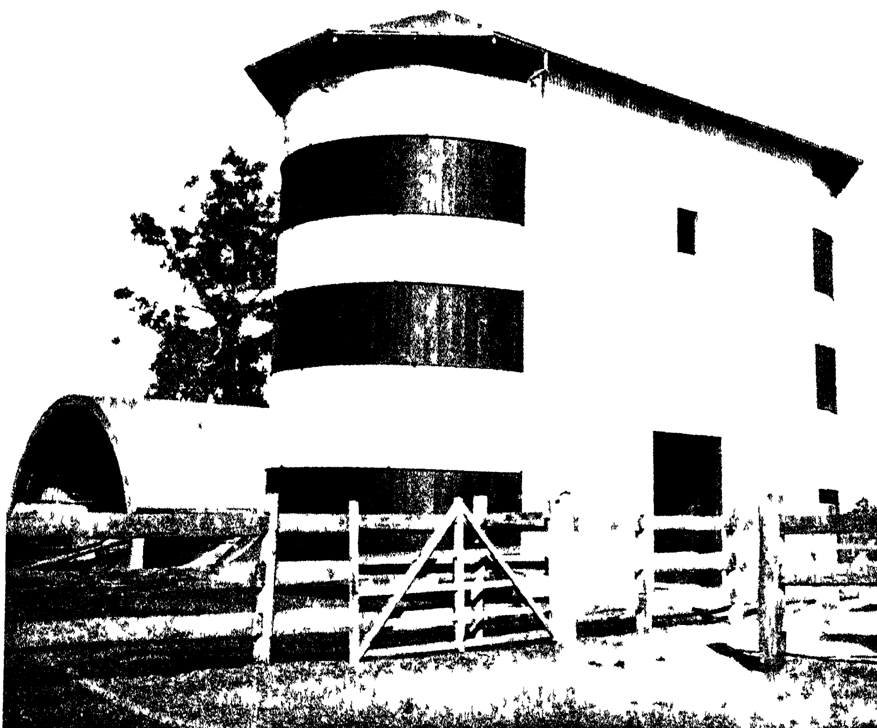
To fix the ruberoid you will find full instructions with each roll you purchase, but let me caution you against putting it on carelessly or on a cold day. It must be laid out in the sun to stretch before fixing. For a single silo, a door may be in the roof over the door-frame, to give access to the head of the elevator. A 2-inch down-pipe should be provided to carry off all roof water from the foundation.

Hanging Ladder.

As will be seen on our first overground silo, a light ladder, made of 2 in. x $1\frac{1}{4}$ in. sides, with $1\frac{1}{2}$ in. x $\frac{3}{4}$ in. rungs notched in, and hung to top of silo by $1\frac{1}{4}$ in. x $\frac{1}{4}$ in. wrought-iron hangers, is placed at one side of the door-frame to provide means of climbing up and down. The foot (only) of this ladder is secured to the planks, and may be 2 feet from the ground. A strip of $1\frac{1}{4}$ in. x $\frac{1}{2}$ in. is screwed over the ends of all the rungs to keep them from pulling out.

Painting.

All exposed parts of the woodwork should be protected with three or four coats of white lead and linseed oil paint; and to give the silo a neat and finished appearance, I would recommend that the spaces between the iron hoops be coloured black and white alternately. The oil alone is quite sufficient for other parts.



The H. A. College Twin Silo complete, showing entrance from cow bails.

Silos at the Hawkesbury Agricultural College.

To Keep the Silo in Good Order.

It will only be necessary to clean down the inside after each emptying, and give the planks and door frame a coat of raw oil; also, tighten up any of the nuts requiring to be done, and see that all door planks are fitting properly. Then your silo is ready for filling at any time.

Our Dairy Instructor's Opinion.

"Hawkesbury Agricultural College, Richmond, July 8th, 1902.
"To Mr. Brooks, H.A.C.

"Dear Sir,

"*Re* overground (tub silos) as erected at this College Dairy. I have now watched them carefully for the last two seasons, with a view of seeing whether they were better, and more suitable to the dairymen than the pit silo, and must admit, when constructed as here—with shoot and doorways opening conveniently all the way down, to allow of easy removal of silage—that they answer admirably; and when compared with the underground bricked or slabbed silo, I find they result in less loss at surface, less loss at sides, less cost to construct, and more easily emptied, and requiring no pressure.

"The silage taken from them perfectly satisfies me that there is no just foundation for any objection to the feeding of milch cows with ensilage, and I would feel pleased to see dairymen providing for a time of need by erecting them whenever possible; indeed, I see no necessity so great to dairymen, if this State is to keep up her output of dairy produce, and provide against the starvation of all dairy stock. I also feel satisfied these silos will stand for a life-time when well constructed. "I remain, &c.,

"P. H. SUTER,
"Dairy Instructor."

Hawkesbury District Farm Notes—September.

H. W. POTTS.

Owing to the absence of moisture this season cannot be regarded as a favourable one for any crop. The most suitable for this district is maize, and there are several prominent reasons why the invariable rule should be strictly followed, to plant early, the most urgent being the demand for green feed for cattle. The general scarcity of feed of all kinds is felt very acutely at present, and every day renders the situation more apprehensive.

In dealing with a maize crop intended for quickly growing green fodder, it has to be remembered that the method of treatment in planting varies to that required for grain. An abundance of leaves and stalks are the object sought in the former case. When planting it is wisest to do so in drill, instead of broad-casting. Maize requires both heat and moisture to hasten early maturity. The late frosts, if any occur, will doubtless do harm, but prevailing conditions are of such a character as to urge us to accept any risk.

The Hawkesbury bottoms provide a deep, rich, friable loam, which is eminently suitable to the growth of rich fields of maize in any form.

The dry season points to the necessity of ploughing more deeply than is customary to get soil moisture. Where the soil is not rich it will be good practice to adopt that followed at the College Farm, where the best form of enriching the land has been determined by a series of practical tests. It was found that from 1½ to 2½ cwt. to the acre of fertilizer gave the highest returns, and there was 1 part of dried blood to 2 parts of bone-dust.

The aim should be when preparing the soil for maize intended for green fodder, to work up a pulverised, moist, clean seed-bed.

All coarse cloddy surfaces should be rendered fine by the alternate use of harrow and roller.

On most of the lands in this district this condition will not be encountered. When planting is finished the roller should be used freely, to make the soil close and compact in order to retain soil moisture until the plants are a few inches high.

Sorghum.

As with maize the sowing of this prolific green fodder plant ought to be conducted as soon as possible this month. All green fodder crops are looked to with eager expectations this season, and in sorghum we possess a valuable fodder plant that has proved its value for milking cows.

Millets.

The French and Hungarian millets should also be sown freely this month, the former for hay and the latter for green fodder. The great advantage we estimate of so much importance this season arises from the fact that they are available for food much earlier than maize or sorghum. Sheep and cattle alike benefit by this crop. Moreover, when eaten off by sheep successive growths follow in response to the the character of the season. Under ordinary conditions green fodder will be available from eight to 10 weeks after sowing.

Mangolds and Sugar Beet.

These root crops will be much in quest next winter, and with good attention to these crops on rich land and good tillage they pay well as forage for dairy cattle. The early sown crop on ridges invariably gives returns of the most satisfactory description.

Potatoes.

It will be advisable to complete the main planting of those varieties described in last month's notes.

Pumpkins, Melons, and Winter Squashes.

These can be planted out this month. They all form useful fodder for stock and pigs. The earlier they are in the better for both market purposes as well as stock. Experience of the past goes to show that the pumpkin beetle is more troublesome on the first lot planted than on those planted in October and November.

Summer Squashes and Marrows.

The white and golden custard varieties have in the past given the most satisfactory returns in the quickest time.

Artichokes.

Few farmers will now dispute the feeding value of the Jerusalem artichoke in fattening pigs and maintaining them in robust health. Crops of 300 to 400 bushels per acre are of common occurrence, and successive yields may be taken off with splendid results. One prominent advantage in growing the crops is that the animal readily harvests the tubers. The soil should be well drained, friable, deep and moist. A good supply of humus in it is a distinct gain. Well-rotted manure should be ploughed in and the soil brought to a fine tilth. Deep planting is preferable to shallow, especially with cut sets.

"Federation" Variety of Wheat.

I see that the new variety, "Federation," has by mistake been distributed by the Department as a strong-flour wheat. This is not the case. It produces flour which is of little higher strength than is that of Purple Straw, which is a typical weak-flour variety. For some reason the flour-strength of weak-flour wheats grown last season in this State appears to be about 2 quarts of water per sack of flour higher than is usually the case; and this represents about 4½ lb. more of bread. This being the case, the new varieties, "Bobs" and "Jonathan," cannot, as regards flour-strength, be placed in quite the same category as the best of the Fifes and Blue-stems, but come rather about midway between the best Fifes and our old weak-flour varieties. "Scotch Fife" also, according to the examination of it which was made in the laboratory of the Department, cannot be regarded as a strong-flour variety, but goes with "Bobs" and "Jonathan." The strong-flour varieties, properly so called, which have been distributed, are "Power's Fife" and "Minnesota Blue-stem." The former produces the stronger flour, it is also the earlier, and is likely to prove the more widely suitable for this State; although even it will probably only be found to do well in the coldest districts, and even there only in good, deep soils. It is, however, quite likely that varieties like "Bobs," "Jonathan," and "Scotch Fife"—the two former especially—will be found to be the best for our wants. I am pointing out the mistake which has been made in the distribution of "Federation," because I think that this new variety has a career of usefulness before it, and because I am quite sure that its career will be more satisfactory if it does not start on it under false colours. "Federation," also, cannot be regarded as a good resister of rust, but in this quality it is (at Lambrigg, at any rate) decidedly before "Purple Straw."—W. Farrer.

Farm Notes.

RIVERINA DISTRICT—September.

G. M. McKEOWN.

Potatoes.

Planting should be completed as early as possible, the earliest varieties only being selected. Flat cultivation will be found to answer best, so as to admit of the necessary after cultivation, which cannot be properly carried out where the rows are hilled high without injury to the crop. Enough soil only should be thrown up to protect the upper tubers from the heat.

Pumpkins and Squashes.

Sow, as soon as danger of frost is past, on a site as free as possible from this risk. Early plants are frequently killed by late frosts, and fruit which sets late is prevented from maturing by the occurrence of early autumn frosts. The land should be deeply worked, brought into fine tilth, and well manured. The seed should not be sown in raised mounds, but "on the flat," the portions sown being well mulched with stable-manure. King of the Mammoths, Mammoth Tours, and Mammoth Chili are to be preferred for field culture. For table use the following will give good results and be found of excellent quality, viz., Early Orange Sugar Pumpkin, Delicata, Fordhook and Custard Squashes, and Long Green and Long White Bush Marrows.

Melons

Should be sown towards the end of the month in well-prepared land which has been thoroughly pulverised and well manured. The young plants should be protected in localities where there is risk of damage by frost. The following varieties will be found among the best, viz., Dixie, Kleckley Sweet, Wonderful, Sugar, and Cuban Queen. Of rock melons, sow Golden Perfection, Pineapple, Hackensack, and Montreal. Cattle melons should also be sown.

Sorghum.

Sow in deep alluvial soil which has been well tilled. The best varieties are Planter's Friend and Amber cane. Seed should be sown in drills 3 feet apart. Ten pounds of seed will be sufficient for an acre.

Vegetables.

Towards the end of the month sow beans of dwarf and running varieties in situations sheltered from hot winds where water is available. Transplant cabbages and cauliflowers into well-manured land, placing the plants about 2 feet apart in the rows, which should be 3 feet apart to admit of cultivation. Mulch and water freely. Sow tomatoes, and transplant any which may be available from previous sowings.

Shelter from frost should be provided.

BATHURST DISTRICT.—September.

R W. PEACOCK.

Owing to the drought a larger proportion of land is idle throughout the district than ordinarily. The season has been most unfavourable for the cereal crops, and owing to the high prices of all classes of fodder, it may be advisable to sow crops which would yield green fodder and hay, if the spring and summer turned out favourable.

The best of these, for hay, would be Hungarian millet which, if cut just after coming into ear, is easily cured and makes a very passable fodder.

Broom millet and *Sorghum saccharatum* do well in the district, and although not so suitable as the former for hay, produce a profitable amount of green fodder suitable for silage.

Early amber cane and Planter's Friend produce largely, but require a rather lengthy growing season. They are suitable for ensilage and green fodder. Small sowings of these and allied crops should be made about the end of the month upon the light uplands, whilst upon the alluvial bottoms it may be wise to leave it until the beginning of October, as the frosts are more severe in such situations.

Maize can be sown upon the uplands about the end of the month for green fodder, ensilage, or grain. It thrives best upon the rich alluvial soils and upon virgin uplands. Upon the alluvial soils it would be better to defer planting until a fortnight later.

Potatoes can be sown largely during this month for the early crop, and where frosts are not severe during the beginning of the month. Early Rose, Brownell's, and Bliss' Triumph, are three of the most suitable varieties for this season. They require well-worked and well-manured soil and require a continuous growing season.

Mangolds should also be sown largely, as well as Jerusalem artichokes and field carrots. These roots have been very much neglected in this district, and their value for winter food is not fully recognised. They require thorough cultivation and deeply-worked soil. They can be pitted down and kept throughout the winter.

Pumpkins can be sown upon the uplands about the end of the month. A good crop of Mammoth cattle pumpkins are profitable for both cattle, sheep, and pigs. As the period when the frosts cease varies considerably during different seasons, large sowings of these plants, excepting potatoes, liable to be frosted, should be deferred until the beginning of October.

Vegetables.

The planting out of asparagus roots should be completed early in the month and also rhubarb roots.

Cabbage, lettuce, carrots, parsnips, beet, celery, peas, radishes, and turnips may be sown.

Land should be prepared for the reception of tomato plants early in October.

Orchard Notes.

W. J. ALLEN.

September.

Unfortunately for many of our citrus fruit-growers the picking and packing of their fruit will not be claiming the same amount of attention as in previous seasons; increased time and energy, however, should be spent on the tillage, pruning, and manuring. In cases where trees have suffered severely from the drought, losing many of the small and other branches throughout the tree, these should be removed, and if it is possible to do it now before the growth commences, so much better will it be for the tree, which will in consequence be in better condition for setting and carrying the new crop of fruit. Trees which have suffered should if possible be either manured or soiled, and the ground given the very best of cultivation in order to assist it in retaining the moisture.

Where winter crops of peas, vetches, &c., have been growing among the trees, it is time to think of turning them under, so that they may become thoroughly rotted before the hot dry weather sets in. Where the land is at all inclined to bake and become lumpy, it will be found advantageous to run the harrow or some such implement over the day's ploughing just before quitting work in the evening. This will pulverise the soil and put it in good condition before it has time to bake and form large lumps. Of course, this system of working applies to all trees, citrus and deciduous alike.

In many places where there is little or no rainfall during the summer, the trees are dependent for moisture to carry them through the summer on what can be retained and stored in the soil, and, therefore, if the ground is hard and not in a condition to receive it, the rain will run off as it falls, in place of soaking in and penetrating the subsoil. In those other and more fortunate districts, however, where ordinarily rain falls at intervals right through the summer, the orchards can be ploughed, and put into condition at a later date; however, it is not safe to put this work off too long, as our last year's experience teaches us that we must keep all the orchard work well up in the early spring, and not be caught napping, else we may lose our crops, and our trees may have a bad set-back into the bargain.

In going through different orchards in the State I have seen quite a number of good crops of tares and peas growing as a green manure, and I am very pleased to see so many obtaining such good results. This is a step in the right direction, as there is no cheaper nor better method of supplying the land and trees with the humus, nitrogen, &c.,

so needful to both. As I said before, however, these must be turned in while there is sufficient moisture in the ground to rot them, because unless properly decayed much harm instead of good may result.

All trees should be well dug around with the fork, and the soil brought to a fine tilth.

I trust that every grower of deciduous trees has taken the precaution of giving them a winter's spraying with lime, sulphur, and salt, as, though it may not be a nice spray to work with, there is none other to take its place, as it is not only a valuable insecticide, but also a fungicide. It keeps in check the various scales, prevents peach curl, and cleans the trunks and limbs of the trees. While using this spray the hands should be well oiled or greased, otherwise they will become very sore.

While I am a thorough believer in spraying, I never recommend growers to spray the trees while they are blooming, else the bloom will be either partially or wholly destroyed; therefore, spraying should always be done either before the buds have burst or after the petals have fallen.

Where quickly-acting manures have not as yet been applied they should be used now as early as possible. In districts where rains fall at intervals during the spring and summer, I would prefer making two light applications rather than one heavy dressing—the first now, and the second just after the fruit is well set—two months hence.

Planting of citrus trees should also be proceeded with as early this month as possible—such planting having this advantage, that as soon as the tree is planted it should commence to grow immediately; which is, I consider, a much better plan than removing a tree during the cold winter months, when, after being planted out, they are subject to cold winds and often frosts, the latter being frequently responsible for the death of the early-planted trees in those districts where they prevail. Further, it has been proved by experiments that there is always a certain amount of evaporation going on from a tree during the summer and winter, and this evaporation must weaken to a certain extent the tree which has no direct source of supply; therefore, where full planting is to be carried out, the tree should be planted early, so that the roots may become established; or plant in the spring just before the growing season or just after the first growth. Of course, where irrigation is not practised, the early spring planting must be carried out; but the winter moving of citrus trees is very apt to terminate in loss or injury to the trees so moved.

All fruit trees and vines should have had their winter spraying completed by the first of this month. Black aphis is still doing much damage to the peach and nectarine trees principally, and should receive careful attention. As soon as the petals have fallen all pear and apple trees should receive a thorough spraying with Bordeaux mixture (summer strength), and to each 12 gallons add 1 ounce of Paris green. From experiments which I have carried on, I consider that the application of Paris green at this time of the year for the destruction of the codlin moth is very beneficial, although many growers are not of this opinion.

There is no doubt but the store-rooms where the fruit is kept are largely responsible for the secretion and harboring of a large number of moths. These should, therefore, be made as tight as possible, so that when the grubs hatch out in the spring they may be destroyed. I have seen hundreds of cocoons in a single fruit-room, and have caught the moths at the windows in the early spring in the same room; and, therefore, I say the grower cannot expect a clean orchard so long as he protects the moths in his buildings.

Trees will commence to grow this month, and towards the latter end it may be found advisable to go over them and rub off all the young growth which is not needed to make the crown of the tree, leaving buds starting from different points around the barrel of the tree where it is desired that the limbs should start from which are to form the crown. Never allow two to start from the same place, keeping them at least 4 inches apart, radiating around the tree. Citrus trees may be pruned this month.

Grafting of nursery stock trees and vines may be carried out this month. Vines are best grafted just as the buds are about to burst, and after the grafting of deciduous trees has been completed.

JUTE.

IN answer to an inquiry by D. E. Veness, Manilla, Mr. C. T. Musson reports:—Jute is suitable for land that is not of a stiff, clayey nature for growing along the north-east seaboard from the Hunter River to Queensland. It requires a moist, warm climate. October is about the time to sow, and the plant matures in about four months—*i.e.*, it is ready to cut for fibre as soon as the flowers open. If left until seed ripens the fibre is inferior. There is but little after-cultivation, the plant rising to a height of from 5 to 10 feet according to variety and suitability of soil, &c. Even sowing encourages regularity of crop. The fibre is extracted by water retting. Two difficulties stand in the way of successful jute cultivation in this State:—

1. Labour. We have not the cheap labour of India, where it can be successfully grown.
2. There is no suitable machinery as yet for extraction of fibre.

It may be said there is always a market for good, clean lots of any kind of fibre.

Information *re* varieties and their cultivation may be obtained from *Agricultural Gazette*, Vol. I Part 1, page 292: or *Dictionary of the Economic Plants of India*, Watt, Volume II, under article "Corchorus."

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of September.

Vegetables.

September is generally considered the beginning of spring, and vegetation of all sorts begins to show signs of activity, owing to the increase in the temperature of the atmosphere and the soil, and a good deal is due to the daily-increasing sunlight. A great number of varieties of vegetable seeds may be sown during the month; but there is a good deal of risk in sowing too extensively of tender kinds in those inland and upland districts subject to heavy frosts.

The popular tomato can be sown, or planted if stock has been raised for the purpose, in those districts lying along the coast, as well as in all districts where the chances of visitations of frosts have passed. As this vegetable will grow like a weed in congenial places (and I have seen it growing by the acre self-sown and quite a weed), everyone with a garden should be able to grow it, and enjoy it to their heart's content.

It seems almost incredible that with our facilities of growing tomatoes in New South Wales that larger quantities are imported annually from the United States, in tins. And it seems a marvellous thing also that even carrots are imported in tins as well as other vegetables, such as peas, asparagus, and beans.

September is a very busy month in the garden, especially where work is behindhand; that is, where preparations had not been made for the sowing and planting of spring and summer crops.

Asparagus.—It may not be too late in cold districts to plant this useful vegetable. If the plants have not begun to shoot they may be safely moved from the seed bed to their permanent bed.

Arrowroot.—If you have sufficient space in your vegetable garden, plant out some tubers of arrowroot, provided your locality is in one of the warm districts of the State. This plant may be seen in patches in many gardens, growing without the slightest care, and probably no use is made of it, possibly for a want of knowledge as to how to obtain the starchy matter from the roots. There should be no difficulty in making excellent arrowroot, for all that is needed is a good supply of clean pure water and a rough grater The latter can be made from a side of a kerosene tin, bent into a half circle and nailed on a board; but before nailing on the board, knock as many holes through it as you can with a large nail or the sharp end of a file. The writer has used such graters frequently and they answered admirably for grinding

up the roots into a pulp. When sufficient pulp has been ground up, it should be allowed to soak in water for some time, then rubbed about and strained on a fine sieve. The starchy matter termed arrowroot will sink to the bottom of the water, which may then be poured off. Frequent washings will be necessary before the starch is sufficiently clean and white for use. It should be spread out on clean cloths in the sun to thoroughly dry, after which it can be put away in bottles or jars until required for use. The best kind of arrowroot is made from a small-growing plant, *Maranta arundinacea*, which grows to a height of about 2 feet. This plant is not plentiful in this State, and requires a warmer climate than the common arrowroot, *Canna edulis*. Either of these should be planted about the end of the month.

Beans, kidney or French.—A most useful, prolific, and easily grown vegetable, the seed of which should not be sown until frosts are all over. The ground should be well dug, and made as level as possible. If artificial manures are used, those containing a large percentage of ammonia or nitrogen, such as sulphate of ammonia, guano, nitrate of ammonia, blood manure or soot, need not be used; but superphosphate of lime and potash, old lime rubbish, lime, gypsum, and bone-meal may be applied with every chance of improving the yield of the beans. The seed should be sown in rows 2 ft. 6 in. or more apart. Make drills about 3 or not more than 4 inches deep, and drop the seeds along the bottom of the drills 4 or 5 inches apart, cover with fine soil, and firm down with the back of a spade. Seed, as a rule, is sown too thickly together, and the beans have not sufficient space to grow properly. Two rows of dwarf beans, 15 to 20 feet in length, will be quite sufficient to sow at a time. In about two weeks after sowing, put in two more rows, and so on, in order to keep up a continuation of this excellent vegetable. It is advisable to grow the dwarf kind only, for the runners need to be supported, and this always takes considerable time and trouble which might be better expended on other vegetables.

Bean, Lima.—This should be treated in the same manner as the kidney bean. The seeds, either in a green or dried state, are used, and not the pods. There is a tall-growing runner variety, and also a dwarf; the first-named bears the best beans. Sow the seeds wider apart than those of the French or kidney bean. The very best tall variety is king of the garden.

Beet, Red.—Sow a little seed of this useful vegetable in drills 1 foot or 18 inches apart, not deeper than 1 inch. As the seed takes some time to germinate or come up, it can be started into growth if put between damp flannel, or damp bags, in a warm place. As soon as the shells begin to burst, sow in the drills, and then water before covering with soil. As soon as the water has soaked into the soil cover up. Mark the ends of the rows with short sticks, so that you can tell, when weeding the beds, where the plants will come up. Use globe varieties.

Fresh manure should not be used for this vegetable.

Beet, Silver.—Manure the ground well for this vegetable, in order to induce the growth of good succulent leaves, for the leaves only are

used, and not the root, like the red beet. A single row, a few feet in length, will be sufficient if the plants are well cultivated and sometimes supplied with a good soaking of liquid manure, made from the droppings of animals.

Cabbage.—Sow a little seed in a seed-bed. Make little drills about a quarter of an inch deep with your finger, sow thinly, and cover with fine soil. Then get some old dry cow-dung, break it up fine, and scatter over the surface about a quarter or half an inch deep. This will be found exceedingly useful also for any other kind of vegetable seeds. It acts as a mulch, and prevents the evaporation of moisture, when sometimes, and not infrequently, necessary watering is forgotten. Do not aim to grow immense cabbages, which are suitable only to feed cattle, but grow small and medium sized kinds, for they are much more palatable and better flavoured.

Plant out some young cabbages, if you have any large enough to transplant, to a well-dug, well-drained, and well-manured bed. Use a good dressing of dung, if possible thoroughly rotten. Plant in rows about from 2 to 3 feet apart according to richness of soil. If the weather is dry water the cabbages well as they grow, and also give them occasional supplies of liquid manure. Cultivate frequently between the rows, and keep the plants quite free from weeds. The more the hoe is used amongst cabbages the better they will grow. They prefer a rather stiff soil, but will thrive, with a little care and plenty of manure, almost anywhere.

Cauliflower will succeed best at this time of year in the coolest districts of the State. Follow the directions given for the cabbage. Plant out a few plants, and also sow a little seed in the seed-bed.

Carrot.—A useful vegetable for many purposes in cookery. Sow a few rows of the short as well as medium and long varieties. The ground should be dug up deeply, but not freshly manured. The best kind of soil for the carrot is a fairly rich, sandy loam, well drained. The rows should be about 1 foot to 18 inches apart. Be careful to separate the seeds before sowing, and cover them with about half an inch to an inch of fine soil. As the seed generally takes a long time to come up, care must be taken that the tender young seedlings are not crowded out by weeds.

Celery.—Sow some seed in a small seed-bed or box. The soil should be made very fine. If sown in a box take care to make holes in the bottom of the box, put in a layer about 2 inches deep, of broken stones, crocks, charcoal, or something similar as a drainage, before putting soil into the box. Make little drills with your finger, as straight as you can, and sow the seed, which is very small, as thin as possible. Cover with fine soil, and spread over this some broken-up, old, very dry cow-dung. As the plants come up thin them out if they appear to be growing too close together. When they are about 2 or 4 inches high transplant to a well-prepared small bed. Plant about 4 inches apart, so that they can grow into strong little plants for further planting out into trenches later on.

Cucumber.—In the warm districts seed may be sown towards the end of the month. The ground should be thoroughly well dug up, well manured, and well drained. It is a general custom to make holes about 3 feet or so in diameter, and manure the holes, but it would be a much better practice to manure the whole bed set apart for the cucumbers. The plants may be raised in a seed-bed or box, and afterwards transplanted when their second leaves have grown. This is, perhaps, better than sowing in the garden, and more certain, but it takes a little more trouble. If the seeds are sown in the garden, put in at least half a dozen seeds in each place where the plants are to grow, and if all the plants come up they can be thinned out to one or two, and those thinned out can be planted in some other place if needed. It is always better to sow a good many cucumber seeds, as they are generally unreliable, and numbers fail to germinate. Although special holes need not be made for the purpose of being manured if the whole bed has been prepared as above suggested, it would be well to make shallow depressions or basins an inch or two deep in which to sow the seed, for this will be of assistance if watering the plants should be necessary.

Endive is a kind of chicory used as a salad generally, although it may be cooked as spinach. It is a good wholesome vegetable, but is not used as much as it deserves to be. Seed may be sown this month in a warm corner where frost cannot attack it. When the seedlings are large enough to handle they may be transplanted to a well-manured bed. Plant out in rows about 15 inches apart, and let the plants stand about 1 foot apart in the rows. Keep down weeds, and when the plants have grown to a good size tie up the leaves together in order to blanch, or make white, the inner leaves. All the plants need not be tied up at the same time, but a few now and then, as they are likely to be required for use.

Leek.—A most useful vegetable, and exceedingly wholesome, generally used in soups, but excellent boiled and served with white sauce. The plant is a most greedy feeder, and needs plenty of manure; in fact it may almost be grown in manure. The best kind of soil for the leek is a sandy loam, moist, but well drained, but it will succeed well on almost any kind of soil if it be well manured. The seed should be sown in a seed-bed, and when the plants have attained a height of 6 or 8 inches they may be transplanted to a bed that has been well dug and heavily manured. Plant deep in rows 18 inches apart, the leeks to be put in at about 9 inches from one another. Water well, and from time to time apply liquid manure. The thick stems are generally blanched by "earthing up" the soil about each plant some time before they are required for use. A little experience will soon show the length of time required to blanch them.

Lettuce.—A most useful vegetable for salads. The seed is generally sown in seed-beds in a similar way to cabbage, but at the present time of year it is preferable to sow where the plants are intended to remain. Sow in shallow drills about 18 inches apart. When the seed comes up thin out the plants to about 1 foot apart. The ground

should be well manured with rotten dung, and as the lettuces grow give them frequent applications of liquid manure.

Melons, Rock.—Seed may be sown in warm districts, in the same way as was directed for cucumbers.

Melons, Water.—Sow seed also as above, but the plants must be allowed considerably more space.

Okra or Gumbo.—A vegetable bearing a succulent, gummy, or mucilaginous pod, which is used for thickening soups. Suitable for warm climates. Sow seed in a box or seed-bed, and when the plants are large enough to move, shift them to a well-manured bed. Let the plants stand about 2 feet apart each way.

Onions.—A good supply of this vegetable is very desirable. The ground should be heavily manured with well-rotted dung. Take care to drain well and make the surface soil as fine as possible. Light rich, sandy loam is best suited for the onion. Besides rotted dung, soot, blood-manure, ashes, and bone-meal may be used with good effect. Soot mixed with coarse salt is exceedingly useful as a top dressing when the onions have attained some size. Sow the seed in rows 6 inches to 2 feet apart, according to the size of onion it is required to grow. The seed should be merely covered with fine soil, in fact hardly covered at all. When the plants are an inch or so in height, thin them out and transplant, if you like, to another bed. Keep as free from weeds as possible, and stir up the soil occasionally between the plants.

Parsnips.—Sow a few rows in just the same way as was advised for carrots. They are very deep-rooting plants, and the soil should be dug to a considerable depth.

Peas.—A few rows should be sown from time to time, especially in the cool parts of the State.

Pepper (capsicum).—A plant or two is all that will be needed in a small home garden. The seed may be sown in a box, and the seedlings transplanted when they are a few inches in height. They come to the greatest perfection in the warm climates.

Potato.—Every garden should have a few rows of potatoes if possible. Manure the ground heavily with dung, drain well, and dig deep. Use medium-sized, sound potatoes to plant. Discard small ones altogether. If you can only obtain large ones cut them into two or three sets, and let them be dried by sprinkling with wood ashes and a little lime or dry soil. Make the rows 2 feet 6 inches apart or wider, and plant the potatoes about 6 or 8 inches deep in the soil, 1 foot from each other in the rows. Some of the best varieties are, Brownell's Beauty, Early Rose, Kidney, and Early Puritan.

Pumpkins.—Sow a few seed in ground to be prepared as for cucumbers, using plenty of dung. Sow the seed six or eight in a hole; the holes to be about 8 feet apart, or even more.

Rhubarb.—The present is a good time to sow seed of this vegetable. Roots are generally obtained to plant out and time is thus saved, but

in many localities it is difficult to obtain roots when they are required. Sow in drills in a seed-bed, and when the seedlings are large enough to handle transplant to a well-dug and well-manured bed, where they may remain until large enough to plant in their permanent places. There is no necessity to sow much seed, as a dozen plants will suffice for an ordinary family.

Tomato.—Seed may be sown in the open ground in all the warm districts. The best plan is to sow the seed in a box or seed-bed and transplant the young tomatoes when they are large enough to move. Dig the ground well, but there is no occasion, unless the land is very poor, to apply much manure. This vegetable should on no account be forgotten, for it is useful for a variety of purposes. The small fruiting kinds are perhaps the best to grow, as their fruit has a better flavour than the large varieties. The latter are the most ornamental and useful for marketing purposes, perhaps because appearance only seems to be the general guide in the purchase of such things.

Turnips.—Sow a few rows in drills about 18 inches apart on well-manured ground. It is customary to sow turnips broadcast in vegetable gardens, but this is a mistake, for they can be better attended to, weeded, and thinned if sown in drills. Do not cover the the seed with more than half an inch of fine soil.

Vegetable-marrow and Squashes.—Sow seeds in the warm parts of the State. The sowing will be the same as that recommended for cucumbers.

Flowers.

During the month of September, flowering plants of all kinds make rapid growth, and the garden becomes beautiful with fresh young foliage and numerous flowers. Those who have been watching with interest for their new plants to flower will soon be gratified, for during this and the following month (October) all the spring flowers will have expanded. The anemones, ranunculuses, daffodills, forget-me-nots, pansies, hyacinths, violets, some camelias, early roses, and many other plants should be in bloom. One of the most welcome of little flowers is the sweet violet. Everyone likes the violet, and very properly so, if only for its delicious fragrance; but the best kinds are not always grown, for there are many varieties of more or less merit, and amongst the best are the doubles which succeed well in cool districts. It is a great mistake to allow violets to grow for years in the same spot without taking them up sometimes, dividing and replanting after the ground has been well dug and manured. In some cases it would be advisable to throw away all the old plants and obtain healthy new ones.

Comparatively tender plants, such as bouvardias, may be planted, and they will soon push ahead and make good plants. Bouvardias bear very pretty flowers indeed, and are easy to grow. If the soil should be very dry they will need watering or they will probably die away. There are many varieties, and some of the best are brilliant,

bearing flowers of a bright red colour; *Candidissima*, white, one of the most useful of the bouvardias; Dazzler, scarlet; *Elegans*, brilliant scarlet; *Hogarthii flora pleno*, rosy-salmon, double-flowered; *Humboltii corymbiflora*, large white sweet-scented flower; Laura, pink; *Longiflora Glammea*, rose; Maiden's Blush, a very useful one, flowers pale pink; President Garfield, pale peach, double flowered; Priory Beauty, rose-coloured; Triomphe de Nancy, orange salmon, double-flowered; *Umbellata carnea*, blush; Vreelandii, white; Jacquinii, scarlet, a most useful but old variety; President Cleveland, deep scarlet, single, one of the best of the bouvardias; Beauty of Brisbane, a pure white.

Prune back rather hard any old plants of bouvardias there may be growing in the garden.

Plant out pelargoniums or other evergreen plants or seedlings which may be in stock, but be sure to water them well and shade from the sun until they become well established.

Sow seeds of tender annuals as well as of perennials either in the garden or in boxes, or kerosene tins, or anything that will contain soil, so long as it has an opening in the bottom to allow of surplus waters draining away. Anything planted out this month will need a good deal of care and attention, if the weather is hot and dry.

Culture of the Passion Vine.

Mr. G. Alderton, jun., writes:—"Would you kindly give me information *re* culture of passion vines, and your opinion on prospects of growing same in a soil growing blackbutts, redgum, and stringybark. The soil in one part is composed of from one to two feet in depth of sandy loam, and in others it is more of a sandy reddish clay. The latter is the heavier and moister soil, but I fancy the other, because the situation is higher and the aspect is easterly. I propose to raise the passion vines from seed sown in a seed-bed in spring, and transplanting to rows of, say, 10 feet x 12 feet. Is this distance correct, and would it be best to trellis fence fashion, which would mean hand-hoeing all between the plants one way, or could I use trellises high enough for horse-work each way?

I also intend to grow tomatoes between rows while vines are small. I mention this, as a market gardener told me he would not grow tomatoes on his farm, as the land will grow nothing after them.

Would you advise pruning passion vines each year, say, leaving a main leader to top rail of trellis, and pruning all laterals back to same each year (between growths)?

Would Jordan almonds bear in this district? The elevation is about 500 or 600 feet, and nearly free from frost?"

In reply, the Fruit Expert, Mr. W. J. Allen, expresses the opinion that the sandy loam referred to should grow good passion fruit, provided the frosts are not too severe. The vines would not do so well on the more clayey red soil. If it were a red sandy loam they would probably do well, but, generally speaking, they do not do well when planted in heavy soil. Ten feet by 12 feet apart is as close as passion

vines should be planted in rich ground, and they are better a little further apart. The best form of trellis is one of posts and wire, with a post between every second vine projecting 5 feet out of the ground; on the top of the posts are fastened two wires about 6 or 8 inches apart, the vine to be trained up a stick or small pole until it reaches the wires, then trained along the latter. Mr. Allen would not recommend a higher trellis than 5 feet. A good man with a horse and cultivator can work nearly all the ground without having to do much handwork. Mr. Allen would not advise growing anything between the vines unless manure is applied liberally, as, if the plantation is expected to pay, the ground must not be robbed of its best properties by rapidly maturing crops before the vines themselves have come into bearing. It would be a great advantage to the vines if it were possible to lime the ground before planting. The dressing in the case of soil indicated should be at the rate of not more than one ton per acre.

All information *re* pruning passion vines will be found in Mr. Allen's special article in last issue, p. 848.

It will not pay to grow Jordan almonds in the coastal districts.

AGRICULTURAL SOCIETIES' SHOWS, 1902.

Society.	Secretary.	Date.
Junee P., A., and I. Association	G. W. Scrivener	Sept. 3, 4
Murrumburrah P., A., and I. Association	J. A. Foley	,, 3, 4
Young P. and A. Association	C. H. Ellerman	,, 9, 10
Manildra P. and A. Association (Exhibition and Ploughing Matches)	G. W. Griffith	,, 10
Moama A. and P. Association	C. L. Blair	,, 10
Albury and Border P., A., and H. Association	W. J. Johnson	,, 10, 11
Yass P. and A. Society	W. Thomson	,, 11, 12
Berrigan A. and H. Society	G. Hamilton	,, 17
Germanton P., A., and H. Society	G. T. S. Wilson	,, 17, 18
Burrowa P., A., and H. Association	John N. Clifton	,, 18, 19
Temora A. and P. Society	W. H. Tubman	,, 23, 24
Wentworth P., A., and I. Society	Jas. W. Thorn	Oct. 21

1903.

Society.	Secretary.	Date.
Berry Agricultural Association	A. J. Colley	Feb. 4, 5, 6, 7
Moruya A. and P. Society	John Jeffery	,, 11, 12
Ulladulla A. and H. Association (Milton)	C. A. Cork	Feb. 18, 19
Crookwell A., P., and H. Society	C. T. Clifton	Mar. 5, 6
Berrima District A., H., and I. Society	J. Zeo	,, 5, 6, 7
Central New England P. and A. Assoc. (Glen Innes)	Geo. A. Priest	,, 10, 11, 12
Goulburn A., P., and H. Society	J. J. Roberts	,, 12, 13, 14
Inverell P. and A. Society	T. P. Borthwick	Mar. 18, 19, 20
Armidale and New England P., A., and H. Association (Armidale)	W. H. Allingham	,, 18, 19, 20
Newcastle and District A., H., and I. Association	M. A. Fraser	,, 19, 20, 21
Orange A. and P. Association	W. Tanner	,, 25, 26, 27
Mudgee Agricultural Society	Joseph M. Cox	Apr. 1, 2, 3
Royal Agricultural Society of N.S.W. (Sydney)	F. Webster	,, 8–16
Dungog A. and H. Association	Chas. E. Grant	,, 29, 30

[9 plates.]

Sydney: William Applegate Gullick, Government Printer.—1902.

"Horse-breeding in England and India, and Army Horses Abroad": by Sir Walter Gilbey, Bart.

(Continued from p. 918.)

ALEX. BRUCE,
Chief Inspector of Stock.

Horse-breeding in France.

France now, for stud purposes, is divided into six districts, which contain 22 Government studs for stallions. From these studs 3,038 stallions of different breeds are distributed among 689 local covering stations for the public service.

The report of the Inspector-General of Horse-breeding operations, in 1899, gives the following list of stallions serving in that year. These are divided into three classes:—

Thoroughbreds	Arabs	105	
	Anglo-Arabs*	260	
			627
Not Thoroughbreds	Southern half-breds†	164	
	Normans and Vendeans	1,384	
	Qualified trotters‡	261	
	English hackneys	71	
	English hackneys, cross breds§	78	
			1,958
Draught	Percherons	278	
	Boulonnais	61	
	Ardennes	54	
	Britons	51	
			444
			3,029

Since the year 1899 the Government have increased the number, and this year the total number of stallions is 3,450.

* Cross between English thoroughbred and Arab.

† Southern (du Midi) horses are bred in the Tarbes district, and have a long strain of Arab blood.

‡ Certified to have trotted one kilometre (about 5 furlongs) in 1 minute 40 seconds. These horses have been graded up from hackney sires which were imported from England forty or fifty years ago.

§ Cross between English hackneys and hunter mares imported from England.

From the table showing how the stallions are distributed among these 22 studs we may select two important examples: The stud at Tarbes, in the Pyrenean region, where light horses are chiefly bred; and Le Pin, in Normandy, where heavier saddle-horses, carriage and light draught, and a proportion of heavy draught horses are produced.

At Tarbes, in 1899, the horses available for distribution among covering stations were: Thoroughbreds, English, 34; Arabs, 27;

Anglo-Arabs, 48; total, 109. Half-breds, Southern horses, 37; Normans and Vendeans, 7; Norfolks, 4; total, 48. In all 157 stallions.

At Le Pin, the following were available for distribution:—Thoroughbreds, English, 22; Arab, 1; Anglo-Arab, 11; total 34. Half-breds, Southern horses, 3; Normans and Vendeans 97; qualified trotters, 55; Norfolks, 20; total, 175. Draught sires: Percherons, 67. In all, 276 stallions.

The largest stud in France is that at St. Lo, in Normandy, whence 365 stallions were distributed in 1899; but it is less representative than the two of which details have been given, consisting of 281 Norman and Vendean stallions, with 59 qualified trotters and 25 English thoroughbreds.

To further illustrate the system, let us take one small covering station, to which there are hundreds similar—that at Lesparre, in the Medoc. The stallions which stood there for three months during the past season (1900) at Lesparre were as follows:—

(1) Monbran—Thoroughbred. Fee for half-bred mares, 5s.; for thoroughbreds, 16s. 8d.

(2) Balsamin—thoroughbred Anglo-Arab (*i.e.*, by a thoroughbred sire; dam by pure Arab). Fee, 5s.

(3) Troupide—half-bred (by thoroughbred Anglo-Arab; dam by half-bred Norman sire). Fee, 5s.

(4) Rip Rip—half-bred trotter (by thoroughbred; dam by half-bred Norman sire). Fee, 8s. 4d.

(5) Risque à Tout—half-bred trotter. Fee, 5s.

(6) Piédestal—half-bred Norman. Fee, 5s.

(7) Qina—half-bred Norman. Fee, 5s.

All these "half-bred trotters" and half-bred Norman stallions have hackney blood in their veins.

The supply of stallions is adjusted to meet the local demand. The foregoing list shows us that experience has taught the stud authorities to make provision for service by half-breeds of five times as many mares as are sent to the thoroughbred or Anglo-Arab. If we turn to the Finistere Department of Brittany, where post-horses are bred, we shall find the same principle in operation—there stand stallions of a stamp calculated to get the sturdy "blocky" horses for which the district is noted, and which have been graded up from imported hackney sires.

An excellent representative of the stamp of horse produced by judicious crossing is shown in the engraving. This is the portrait of "Radziwill," an Anglo-Norman stallion, descended through his sire from the Norfolk "Phenomenon." "Radziwill," when this portrait was taken last year, was five years old. He is a chestnut, standing a shade under 16·1, and is the model of the high-class carriage-horse. He was shown with his sire "Juvigny" at the International Show at Paris, and the resemblance between father and son was a striking object-lesson in the success with which judicious mating can produce animals true to

type. "Radziwill's" dam was a small Anglo-Norman mare, but, coming of a breed normally big, her foal proved true to his breeding, and furnished into a truly grand harness-horse.

Besides these 3,039 stallions belonging to the State, there is a large number in the hands of private owners. Any stallion whose services are available to the public must be licensed by Government as belonging to one of three classes :—

(1) "Approved" stallions, which are considered good enough to improve the breed of horses. These are divided into two classes. Sires, which earn over 100 francs (£4) per service, form the first class; these receive no bounty from the State. The second-class consists of sizes for whose service 100 francs or less is charged by the owner; these receive an annual premium of from £12 to £80 per year. In 1899 there were 1,334 "approved" stallions, viz. :—

Thoroughbreds	303
Not thoroughbreds	485
Draught	546
	1,334

(2) "Authorised" stallions, which receive no premium, but whose progeny are eligible to compete at shows subsidised by the State. There were—

Thoroughbreds . .	24
Not thoroughbreds	34
Draught	162
	220

(3) "Accepted" stallions, which have nothing to recommend them but a certificate from roaring and intermittent ophthalmia. In 1899, 7,631 stallions were brought before the committees for acceptance for service during the season of 1900, and 7,467 were passed.

There is only one Government stud farm, where sixty mares are kept. This is at Pompadour.

English thoroughbred, Arab, and Anglo-Arab horses only are bred at Pompadour, and the farm is only a small factor in the general scheme of breeding. Improvement is sought principally through the provision of good stallions.

Bounties are also given for brood-mares, filly foals, and as prizes for horse-breaking at public competitions. These measures encourage owners to retain possession of the best breeding stock for the benefit of the nation, and stimulate endeavour among the people to achieve skill as horse-masters.

In every breeding district in France shows are held, at which the young stock are exhibited, and are awarded prizes. The two-year-olds are led, and the three-year-olds are shown mounted.

The judges are officials connected with the neighbouring studs, and one or two representatives of the head office of State Haras in Paris.

About £270,000 of public money is spent annually in France in horse-breeding. The expenditure includes the maintenance of the stallion studs and depôts, purchase of horses, premiums to private stallion-owners, and prizes given at races, local shows, &c.

Horse-breeding in Germany.

The stallions for public service belonging to the State, which in 1896–7 numbered about 2,600, are distributed among seventeen "rural studs," which, in their turn, supply stallions to 899 covering stations. The stallions at the end of 1895 were classed as follows:—

Class I. Light-riding horses, 419 (including 94 English thoroughbreds, 4 Arabs, and 2 Anglo-Arabs).

Class II. Heavy-riding or light draught horses, 1,153.

Class III. Heavy draught horses, 681; Percherons, 2; Belgian and Ardennes horses (draught), 86; Clydesdales and Shires, 71; French and Norman farm horses, 13; German farm horses, 161.

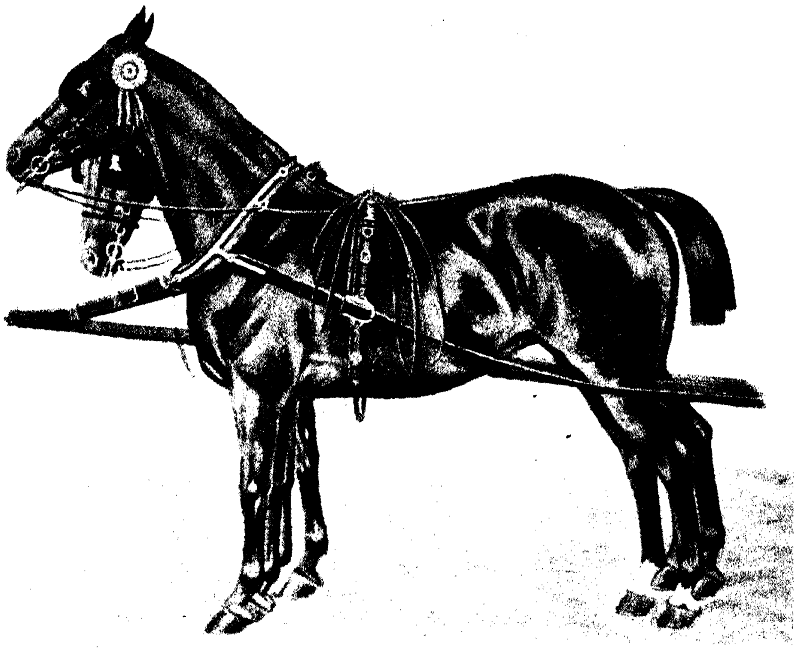
The principal object of the German Government Stud Department is to provide remounts for the army. Of the stallions mentioned above, 1,989 were purchased, only 598 having been bred on the State farms. It may be added, in the year 1884 there were 775 covering stations in Germany, with 2,152 stallions; in 1895 the number of covering stations had increased to 899, with 2,587 stallions. The covering fee charged is generally under £1. Of the remounts supplied to the German army in 1895, about 6,000 were for cavalry; of these, 588 were got by thoroughbred sires.

Privately-owned stallions must be approved by local committees (which also license bulls and boars) before their services may be hired. During the financial year of 1895–96, 2,308 licenses were applied for, and of these 1,488 were granted; 812 were for light riding or light draught horses, 563 for farm and cart stallions, and 113 for crosses between the two. Much is done to promote private enterprise.

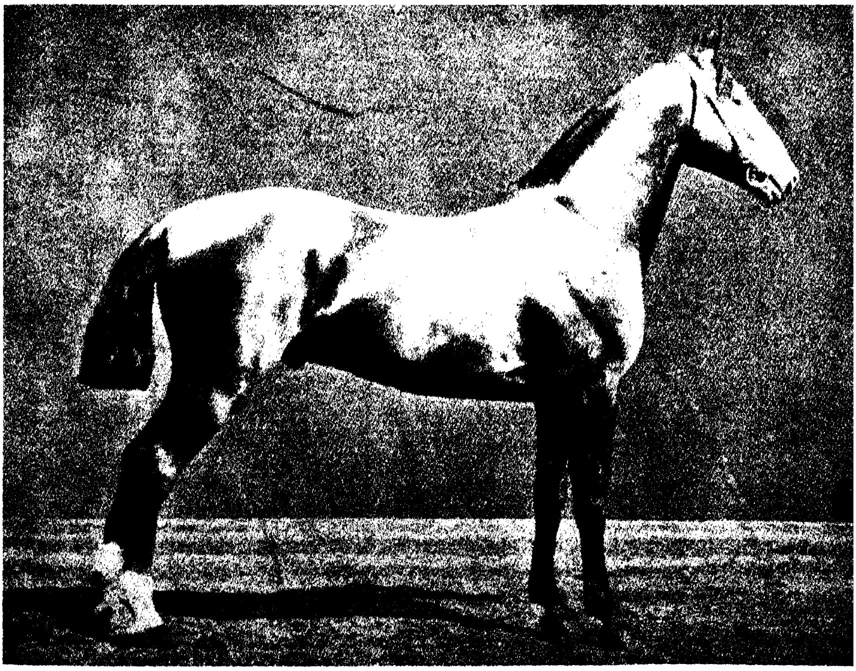
There is a special fund provided by the Government, from which private horse-breeding associations can obtain loans free of interest. Such loans must be repaid within six years. At the end of 1895, sixty-one associations had taken advantage of this fund, the total lent being £5,275.

Brood mares may be purchased on very easy conditions from the Government Supply Depôt at Kalkreuth, the principal stipulation being that the buyer shall have the mare covered by a good half-bred stallion belonging to an Imperial stud, and shall offer the produce, when 3 years old, to the army buyer as a remount. If, however, the owner wish to employ the produce for stud purposes, he is not bound to put it on the remount market. Pecuniary inducements are also offered to breeders to retain good brood mares and rear young stock.

For the convenience of breeders the War Office agents arrange markets at suitable times and places, where young animals on sale as



A pair of Oldenburg Mares, which realise generally about 300 guineas in London.



Anglo-Norman Stallion, "Radziwill," the property of the French Government.

TYPES OF HORSES.

remounts for the army may be inspected and bought. No middlemen are employed.

Horses are purchased by the military buyers at 3 years old. The average price paid is about £38, but purchasing officers are, or were a few years since, instructed to deal liberally with the breeders. The young horses thus purchased are kept at the remount depôts for about 15 months, and are then distributed among regiments.

Mr. Frederick Wrench, in the *Badminton Magazine* of December, 1899, describes the stallions in the rural stud at Celle, near Hanover. There were 250 horses in this establishment, fourteen of which were thoroughbred, and all the rest half-bred Hanoverian. Of these latter Mr. Wrench says: "The regular Hanoverian type is a dark brown or chestnut placid-looking harness-horse, standing at least 16·1, with great limbs, a good look-out, a fairly good back, and long enough to fill any harness." These Hanoverian horses trace their ancestry back to Hackney stock, which was imported into Germany fifty or sixty years ago by Mr. H. R. Phillips. The names of both Irish and Yorkshire half-bred horses still appear on a few of the pedigree cards fixed in each stall at Celle.

Hackney blood was widely diffused over the horse-breeding districts of Germany—Hanover, Oldenbourg, Holstein, Mecklenburg, and East Friesland; for, once Mr. Phillips had introduced the hackney to his German customers, sires and dams with the blood of "Performer" (foaled 1810) and Ramsdale's "Phenomenon" (foaled 1835) were eagerly bought up to cross with the local stock. It is exceedingly probable that the intertrade in harness horses between England and Germany dates back to a much earlier period; the best of the German coach-horses and our own have so much of the same character in common that they would seem to be descended from practically the same stock.

In addition to the seventeen "rural studs" referred to above, there are four State breeding-studs, with about 660 mares and 30 stallions. Of these, Graditz and Trakeham are the more important. The stallions bred at these establishments are sent to the rural studs if they can fulfil the standard of merit required by the committee which is assembled to examine them. Those that fail to satisfy the committee are sold by public auction.

By the distribution of illustrated pamphlets the German Government endeavours to instruct breeders in the best methods of managing stock, and also concerning the stamps of horses required for the army. A typical artillery and heavy-weight saddle-horse is described as follows, for the guidance of breeders:—

"Height at 3 years, 15·1 to 15·2½; when full-grown, 15·2¼ to 16·1¾. Activity, speed, freedom of action, and endurance are required, as in the artillery horse. The breast should not be so broad as in the artillery horse. The fetlock should not be too short; while, on the other hand, if too long it bends too low, and causes the heavy weight carried to produce fatigue on a long march. A good back for the saddle is as necessary in the cavalry horses as a good shoulder for the collar in the artillery horses."

The "general requirements" in horses for the German army are thus detailed :—

(1) Small blood-like head, neck well set on.

(2) Strong, well-placed legs, with big joints.

(3) Well-arched ribs and good sloping shoulders.

(4) Well-formed, strong back, not too long, well-coupled and high-lying kidneys.

(5) Strong hocks, free from disease.

(6) Round, sound hoofs, with healthy frogs.

(7) Sound constitution and good digestion; and

(8) Free, energetic action.

The mares whose portraits are here given are of the Oldenbourg breed. The province of Oldenbourg has long been famous for coach-horses. Oliver Cromwell, when Protector, received as a gift a team of coach-horses from the Duke of Oldenbourg.

The net cost of Germany's horse-breeding establishments is about £190,000 a year.

Horse Breeding in Hungary.

The stud machinery in Hungary is elaborate and expensive. There are four State breeding farms where stallions are bred for the public service. The stallions, which in 1896 numbered 2,838, are sent out to 18 central depôts, and from these upwards of 916 local covering stations are annually supplied. The service fees range from 1s. 4d. to 15s. 4d. Large breeders may hire stallions from the central depôts for the season.

Professor Wrightson, in 1893, made a tour of ten weeks in Hungary, and visited the great studs belonging to the Crown. He observes that the breeding of horses in that country is one of the most popular branches of rural economy, and is carried on not only by the Government but by most of the great landed proprietors, with wonderful results.

Hungarian breeders are at issue with the many English breeders, who look upon the thoroughbred as essential to the supply of half-bred saddle horses. "We have, in fact, no distinct race of saddle horses, but in Hungary they think it quite practicable to raise such a race, possessed of the necessary fixity of character. They still look to England for their supplies of thoroughbreds and Norfolk Trotters"; but, as we shall read, they have in recent years succeeded in their object of establishing breeds of their own.

These Crown studs in Hungary are conducted upon a very large scale. At Mezohegyes there were upwards of 650 brood mares. Colonel Horváth, the officer in charge of the latter stud, addressed to Professor Wrightson a letter of great interest, which shows how the Hungarians have succeeded in establishing fixed breeds of saddle horses.

"The race of horses is throughout half-bred. We have had two studs of half-blood Arabian mares since the years 1825 and 1827; two studs of English mares (Furiosa and Abugress) since the years 1841 and 1842; also the family of Nonius, obtained from France in 1815; two studs of the ancient blood of Lippieza, which is a mixture of Spanish and Arabian blood, since the year 1807; and lately we have begun to form a stud of Norfolk blood with stallions of that race and mares of different indigenous families."

Colonel Horváth proceeds to give the numbers of the mares of the several strains he has named. At that time there were at the stud he directed 136 half-blood Arabs, 148 English, 113 mares of various strains from Lippieza, 220 Nonius or Anglo-Norman mares, and 33 of the Norfolk mares, as the beginning of a stud of this breed. The stallions used included English thoroughbred, pure Arabs, or half-breds belonging to the families named.

Colonel Horváth states that the principle kept in view in breeding suitable stallions is very simple. It is the gradual improvement of a family by the introduction of nobler and higher blood, while at the same time the type of the family is retained. Where more blood is wanted full-blood horses are used according to the previous breeding of the particular family. The produce, when strong enough, is served once more by a thoroughbred, and then the breeder resorts again to a sire of the orginal strain of the family. It is, in fact, a system of breeding from half-bred stock, with the occasional use of thoroughbreds when there is a tendency to coarseness.

Colonel Horváth was asked this question, "Do you hope to establish fixed or permanent half-bred races which may be bred truly *inter se*?" and the answer was: "The families of Nonius, Majestosa (Lippieza blood), Gidran and Schagya (Arab blood), are already constant. Furiosa and Abugress (English thoroughbred) and Norfolk breeds will require 10 or 12 years more of careful breeding."

I should explain that the Nonius strain derives its name from a famous sire of that name which was procured from France in the year 1815. The original Nonius was got by an English horse named Orion out of a mare of the Anglo-Norman breed, which breed was largely built up on Norfolk Trotter blood. To what breed Orion belonged, the writer has not been able to discover; the name does not occur in the lists of thoroughbreds sent abroad which are printed in the General Stud Book.

There were few more interesting stables at the Paris International Show in September last than that of the Hungarian Government. The horses had been selected to illustrate the results of the cross-breeding system described, and these furnished living proof of the sound, practical wisdom which directs stud operations in Hungary. Among them were horses the very model of what the 15-stone hunter should be, and perfectly-shaped carriage-horses. The best were perhaps those of Nonius (Norfolk Trotter) and North Star (thoroughbred) strains.

A number of stallions foaled every year at the Royal studs, and about 200 yearlings, which are purchased annually at an average price

of 235 florins (£23 10s.), are set apart and reared with the view of use as public stallions. At the age of three years these are inspected and classified; about one-half the number are rejected as stallions and cut; the best, to the proportion of about 20 per cent., are kept for service in the Royal studs. and 25 per cent. are sold as "communal stallions"; death accounts for the remaining 4 or 5 per cent. of the total.

The estimates for the Hungarian Horse-breeding Department for the year 1897 amounted to £233,333.

Horse-breeding in Austria, Italy, Russia, and Turkey.

Sir Walter Gilbey has also described the systems of horse-breeding in Austria, Italy, Russia, and Turkey, but it is not considered necessary to take extracts from the descriptions of their systems, as has been done in the case of those of France, Germany, and Hungary, for although not quite the same in all their details as those adopted by the first-mentioned countries, they are so much so as to show that the leading principles on which they are established are similar, and to make extracts from the descriptions of the systems of the four first-mentioned countries would give no additional information of any value. This will be seen on reference to tabulated statements A and B, which have been prepared for comparison and appended to this paper.

STATEMENT showing the description of Stallions annually distributed from the several Government Studs on the Continent among their Covering Stations and the annual supplies of Remounts.

Country	English Thoroughbred.	Arab.	Anglo Arab.	English Thoroughbred and Light Riding.	rm:	Ara		Draug		Ameri Tro
France	262	105	260	.	1,384	yes	78	444		261
Annual supply of Remounts purchased not given.										
Germany .	94	4	2	325	...	...	yes	1,153	yes	yes
6,000 Remounts purchased annually at 3 years old. Price, £38.										
Hungary ..	many	yes	yes	yes	yes	yes	yes	yes	yes	yes
No particulars *re* Remounts.										
Austria	94	many	many	766	94	yes	yes	yes	208	...
No particulars *re* Remounts										
Italy	72	78	6	...	yes	yes	yes	yes	396	...
3,500 Remounts purchased at 3 years old. Price, £24.										
Russia ...	yes	great many	many			many				
7,200 Remounts purchased at 3 to rising 5 years. Price, £13 5s.										

Statement showing amounts expended by Continental Governments in supplying suitable Stallions at Low Service Fees, subsidising Shows, giving Prizes for Young Stock as Remounts, and assisting in other ways.

Covering Fees and Rates.

Country.	Amount expended annually.	No of Districts.	No of Government Studs.	No of Stallions annually distributed	No of Covering Stations.	Thoroughbreds for Thoroughbreds.	Thoroughbreds for Arabs.	Thoroughbreds for Half-bred.	Half-bred (Anglo-Arab or Norman).	Half-bred Norman.	Total amount of Service Fees collected for 1899.
	1899. £										£
*§France ..	270,000	6	22	3,039	689	16/8	5/-	5/-	5/- to 8/4	5/-	51,010
*§Germany .	1895. 190,000	......	17	2,600	899	Generally under £1.					.. ..
Hungary ..	1896 233,333	4	18	2,838	946	1/4 to 15/4.					......
§Austria .	140,000	{ ... State	5 2	....	......	No particulars under these heads.					. .
Italy	30,000	7	.	582	377	No particulars under these heads					...
Russia ..	22,500 (in prizes)	{ .. State	15 4	1,100	...	3/2 to £2/7/6.					...

* Both France and Germany also give bounties to approved stallions in the hands of private owners whose service is available to the public.

§ In these countries, as well as in some of the other Continental countries, privately-owned stallions must be approved and licensed before their services can be hired.

Horse-breeding in India.

[Since Sir Walter Gilbey wrote this portion of his booklet on Horse-breeding in India, a Commission was sent out by the Government of that country to inquire into the causes of the failure of the present system The Report of the Commission has now been received and the gist of it will be found at page 1004.]

Opinions of the late Veterinary-Colonel Hallen.

The first endeavours to improve the native breeds of horses were begun by the East India Company, in the year 1794, and the "Stud Department" then established continued in existence until 1876, when it was abolished. This institution had accomplished a certain measure of success. Some excellent horses were bred there, and were drafted into the stables of our cavalry regiments; but experience showed that the results achieved were not commensurate with the cost of maintaining the studs, and in the year named (1876) the Department was abolished, and the Army Remount and Horse-breeding Departments were created.

The "Department of Army Remounts" had for its duty the selection and purchase of Australian and Persian horses in the local markets, and also of as many suitable country-breds as might be procurable. The Department of Horse-breeding Operations was organised with the object of encouraging the production of suitable country-bred horses, and it is to this department that we direct our attention.

In a remarkably able and instructive paper by the late Veterinary-Colonel J. H. B. Hallen, the then General Superintendent of Horse-Breeding Operations in India, we find the plan of the new scheme clearly laid down. It was, broadly speaking, to establish a native breed of horses, which should, in course of time, render the army in India independent of Foreign markets. The Government was to maintain a supply of stallions of the classes most suitable for improving the native breeds; only selected native mares were to be eligible for service (always gratis) by the Government stallions, these mares being branded to prove their right to service, and also to prevent their purchase by native cavalry or police-horse buyers; a system of prize-giving at fairs and shows, with some slight advantages to the produce of branded mares, was instituted.

Colonel Hallen described these breeds with more exactness.

"The majority of country-bred mares may be said to range in height from 13 hands 2 inches to 14 hands 2 inches, and some few are found as high as 15 hands, and in weight from 6 to 8 cwt. They are, as a rule, remarkably well bred, rather light in barrel, not evenly put together, often of an angular and ragged appearance, with small but steel-like bone of joints and limbs, and measuring from $6\frac{1}{4}$ to $7\frac{1}{4}$ inches under the knee at the top of the shank bone. They have wonderful powers of endurance under either tropical sun-heat or intense cold, with a light weight, say from 10 to 12 stones in saddle or light draught, and after the hardest day's work are never off their feed, but always ready for it; moreover, they will continue doing work on the scantiest of food. To gain greater size and power the Government sanctioned, in 1876, the purchase of 300 stallions, and, with an eye to the lack of substance displayed by native mares, roadster blood was largely introduced. These 300 stallions were sanctioned merely as a beginning—the number was increased as the scheme developed. In 1886, the Indian Stud was composed of the following stallions:—

90 English thoroughbreds.
159 Hackneys and Norfolk trotters.
146 Arabs.
10 Stud-bred horses.
6 Australian thoroughbreds.
2 Turkoman stallions.
1 Persian.

For some years after the new system was inaugurated, endeavours were made to buy full-grown horses for immediate use as remounts, but with little success. A change was, therefore, made, and in 1881 the purchase annually of 150 horses, aged $2\frac{1}{2}$ years and upwards, was sanctioned. This plan gave satisfactory results, and it was extended, young horses being purchased in large numbers and distributed among the rearing depôts, to be kept and trained for ultimate issue as remounts. From 1889, 1,000 young horses have been purchased every year, but, when the number was thus increased, it was found necessary to take the animals at a much earlier age, and the minimum was, in the year mentioned, fixed at 6 months.

The following is Colonel Hallen's description of the stock got by the several imported breeds of stallions. It will be borne in mind that his observations were made after the new system had been twelve years in operation.

The animal got by the English thoroughbred "is, as a rule, handsome in top and outlines of back, hind quarters, and carriage of head and tail, but is often shallow in girth and back rib, light in barrel, and from 70 to 80 per cent. are leggy and deficient in bone of limb. Diseases of legs are more common among thoroughbred stock, *e.g.*, curb, bone spavin, bog spavin, and ring-bone are not infrequently shown. Few of this stock prove fit for British cavalry, and hardly one for horse or field artillery, but some are purchased for native cavalry. Many native breeders are distrustful of this class of sire, as they find their stock do not realise a good price in the market."

Of the stock got by Australian sires, which are English thoroughbreds, foaled and reared in the colony:—

"The young stock often prove better-boned in limb than the stock of imported thoroughbreds from England, but in other points are similar to the stock of the English thoroughbreds."

Turning to the Report of Colonel Queripel, the Inspector-General, ten years after the foregoing remarks were written, we find the complaint that English thoroughbreds of the stamp required to get remounts grow scarcer and harder to obtain each recurring year. "Breeders aim at long-legged, striding animals," which are exactly what India does not require; and, though treated with the most jealous care, the English thoroughbred is liable to develop unsoundness in so hot and dry a climate. Specific objection is made to their feet, which "appear to be getting smaller and weaker every year." On the other hand, a better stamp of Australian thoroughbred had been obtainable in small numbers; seven imported during the official year 1897-8 were between 15·2 and 15·3½ in height, girthed from 68 to 72½ inches, and only one had less than 8 inches of bone below the knee. How these stallions have succeeded at the stud time has not yet shown.

Reverting to Colonel Hallen's paper of 1888, he said of the hackneys and trotters:—

"These have, with country bred mares, produced stock of good bone and power, proving suitable and sufficiently well-bred for army work in India. I may mention that, as a rule, most ef the best-boned stock in the late Stud Department had half-bred blood in them. The Special Stud Commissioners bore this fact in mind, and advised the employing of more half-bred sires, these to be of pure breeds, and showing quality. Some of the half-bred sires that had been imported from England were, in the opinion of the Commissioners, of not sufficient quality, but they found their produce proving excellent for artillery purposes. I, of course, do not wish to imply that every stallion has proved a success; but I do most distinctly affirm that at least 90 per cent. of the half-bred sires have fully realised the expectation formed of them."

After referring to the prejudice with which these horses were first regarded by men accustomed only to the thoroughbred and Arab, Colonel Hallen said :—

"The practical results of horse-breeding [that have obtained, and are obtaining, in India, indicate that such horses (horses capable of doing good work by having blood, bone, and power to enable them to carry and draw the heavy weights of British cavalry and artillery), cannot be produced from the present country-bred mares by mating them with thoroughbred or Arab stock; that very few of the remounts, so bred, prove fit for those branches of the service; but we are having, day by day, more proof that the produce of these mares by half-bred English horses (or, as they are now called in England, hackneys) of pure breed, are well adapted for general army work in India, thus indicating that the more this class of sire—the well-bred half-bred—is employed, a greater chance will be afforded of securing larger framed country-bred brood stock, which in turn will yield still larger framed and boned produce. The mares of this improved and developed stock may in time become large enough in bulk to allow of their being mated to Arab sires, should it be deemed desirable to add more quality and compactness in bone with powers of endurance, which are the well-known characteristics of the true Arab."

Colonel Hallen added that when his employment in stud work began in the Bombay Presidency, twenty-six years previously, he believed it right to use thoroughbred and Arab stallions on the country-bred mares.

"I have now to confess that, on visiting, three years ago, one of the best breeding districts in the Bombay Presidency, and attending an annual horse show held there, I found the stock resulting from the use of these sires, though very handsome in top, and pretty in carriage of head and tail, lamentably deficient in bone and sinew of limb. The Director of the Army Remount Department was present, with the hope of finding remounts, but he did not succeed in seeing one fit for the British services; I believe that not any country-bred remounts for the British services have been secured in the Bombay Presidency. May I, therefore, ask you to remember that thoroughbred and Arab stallions have brought about this result. We should, I believe, rely on the pure half-bred of England as a sire to give more bone and substance to our stock."

Colonel Hallen ceased to direct the horse-breeding operations of India some ten years ago, and, the opinions to which his long experience had brought him not having been shared by his successors, the thoroughbred policy has been resumed. The report for 1897-8 says that some 60 horses got by English thoroughbreds (or about one for each stallion!) were issued as remounts to British cavalry.

A curious commentary on the relative merits of the produce got by the different breeds of stallion in use is furnished by the officials of the department themselves. I am indebted to Colonel Beddulph for a copy of the "Figures of Merit" showing "The percentage of prizes won by each class according to the number of stallions employed." These figures cover the six official years 1886–1892, and show the

stock by "half-bred English"—or hackney—sires easily first, the Australian stallions second place, and the English thoroughbreds third. Figures relating to subsequent years, I am informed, show the thoroughbreds imported from Australia in the first place.

Sir Walter then says: "Without anticipating the conclusions of the Commission, to which reference has been made on a previous page, it may be observed that the original scheme, in the opinion of some good authorities, never had a fair chance. Apart from the absence of the continuity of method, which alone would most seriously retard progress in the desired direction, it was considered that the main purpose of the scheme was subverted at the outset.

Our national love of sport makes its effect felt in India as it does in England, and the effect is not a good one. There is in India always a ready market and a high price awaiting the animal suitable for racing or for polo; and thus the breeder's ambition is to produce such a horse or pony, and to ignore the animal suitable for military use. Opinions are divided concerning the effect the temptation to produce a racing or polo pony has upon horsebreeding as an industry in Northern India; but such authorities as Colonel Hallen and General Luck regard it as a factor which must be reckoned with.

Owing to these difficulties and errors of policy, the establishment of a native breed—the work of many years under the most favourable conditions—has never been seriously attempted, and the production of remounts for immediate use has been made the objective of the Horse-breeding Department. It was impossible that its work under these circumstances should have succeeded as it would have done had those in control been able to ignore the question of an *immediate* supply of remounts. Horse-breeding, it may be suggested, is essentially an agricultural business, and therefore one to be undertaken by a civil department; the business of procuring remounts for troops, on the other hand, is essentially a soldier's task. The error lay in the attempt to combine the two.

Of the Arab sire, Colonel Hallen considered his small size is the only point in his disfavour. It had been Colonel Hallen's hope to gradually grade up with the hackney and trotter cross large-boned and sizeable mares; and he looked to these to throw to Arab sires animals of the right stamp for the Remount Department.

It must not be forgotten that climate and the prevailing normal conditions of life are paramount in determining what the size and character of the horse of any given country shall be. In temperate climes, with good feed, horses of great size can be produced and depended on to maintain their size. In very hot, dry countries, which offer comparatively poor feed, such as Arabia, Persia, and Northern India, as described by Colonel Hallen, we find the native races small, wiry, and active; and, again, in cold regions we find the smallest and most stunted horses.

Only within certain limits, to be ascertained by years of costly experiment, can we hope by crossbreeding to override the natural laws which determine the size of the horse of any country, without materially impairing its valuable qualities. In India, the old Stud

Department, for various reasons, failed to establish an improved breed of horses in the eighty years of its existence; it would be unreasonable to expect that the re-organised Horse-breeding Department should have accomplished the task during the twenty and odd years it has been at work.

Commission appointed by the Government of India in Autumn, 1900, to enquire into the cause of the failure of Horse-Breeding in India.

It will be seen from the extracts which are here given from the report of the Commission—and they comprise all that the Commissioners say on the subject—that they are very strongly against the introduction of the Hackney and in favour of Thoroughbred and Arab sires.

With respect to the Hackney, this Commission in Part I, page 2, of their report say:—"While in England the Commission have been able to obtain a good deal of valuable evidence on the vexed Hunter sire question, and written evidence from the Hackney-Breeders has been received, which goes to show that Hackneys are no longer considered suitable as sires for riding horses."

Again, Part IV, page 16, of their report, this Commission say:—"Incalculable harm has been done by the introduction of the *Hackney Stallions. The type of horse of this class received from England has been inferior and coarse, and the cross with the country-bred mares has produced markedly inferior, ill-balanced, and coarse stock. It was claimed by the advocates of the Hackney sires that they would give room and increase the bone of the country-bred horses. Though the cross may have resulted in room, the bone has deteriorated both in size, shape, and quality. Up to eighteen months the progeny grow shapely, but from that age to three years old they begin to throw out all the bad points of their sires in an intensified form: soft enlarged joints, straight and heavy shoulders, great want of bone, and generally coarse appearance.

"It will take years to breed out all the harm done by these sires, and it is fortunate that the importation of Hackneys has been stopped. Still, there are 43 indifferent stallions of this class at present serving mares in India, and the sooner they are disposed of, as recommended in Part VI, Donkeys and Mules, the better for Indian Horse-breeding."

Then in Part V, page 22, of their report the Commission say:—"Hitherto, half-bred and Hackney sires appear to have been chiefly located in this district, and the Sirdars have preferred to use country-bred stallions, of which several were shown to the Commission. Two of these were very good and would undoubtedly do less harm than a Hackney sire."

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* In the term Hackney is included Norfolk Trotter, under which designation some of the coarsest and worst stallions were sent to India.

Again in Part VI, page 37, of their report the Commission say:—"The Hackneys should be disposed of in the same way (for mule breeding). They would prove serviceable for keeping up the size and room in the brood mares devoted to mule-breeding, and defects which render their progeny for the most part useless as Remount horses, would not affect the mule progeny bred from these mares, and their size would prove advantageous."

Then in Part VIII, page 44, of their report the Commission say:—"It is needless to say that with such success anything approaching to a Hackney sire has been rigorously excluded and the almost unvarying type which seem to prevail among the stock proves that by the intelligent use of highly bred Arab and suitable Thoroughbred sires, horses of the very best class for Indian Remounts can be almost unfailingly produced.

It is scarcely necessary to point out that the tenor of the report by this Commission, so far as it relates to the Hackney, is completely opposed to the views held by the late Veterinary-Colonel J. H. B. Hallen, the General Superintendent of Horse-Breeding operations in India from 1876 to 1892, with regard to the use of entires of that breed as stated by him in the papers which he read at different meetings of the United Service Institution in 1887, 1888, and 1899, on Horse-Breeding, and quoted by Sir Walter Gilbey in his remarks on Horse-Breeding in India. They are seemingly also opposed to the opinion held by Colonel Queripel, Inspector-General of Remounts.

The fact is that, as regards Horse-Breeding, there are two parties in India—the Military Department, which had charge of the "stud department," established by the East India Company in 1791, from which remounts for the army were principally supplied until 1876, when the stud department was abolished, on account of its heavy expense; and a new department, seemingly a branch of the Civil Veterinary Department, termed "The Army Remount and Horse-Breeding Department," established under which, instead of the Government breeding their own remounts, it was arranged that the department should supply the proper class of entires for the use of the native breeders to approved mares, free of charge, and purchase from them the young stock, which would be taken to the different depôts and kept till they had grown up and were fit to distribute to the military where required.

The transference in 1876 of the management of Horse-Breeding, so far as it was to be carried on, and of the supply of remounts and other horses required for the army, from the Military to the Civil Veterinary Department naturally occasioned friction between these departments, and this was increased by the introduction of a different class of stallions, the Hackney and half-bred entires for the service of the native mares; for, as pointed out by Sir Walter Gilbey, the demand among the military for the production of the racing and polo pony would lead them to oppose anything that would be likely to interfere with the production of horses which would be unsuited for these sports. Sir Walter also states that the Military Department kept up its opposition to the transference referred to, and have apparently

induced the Government to stop the further introduction of Hackney sires; and now this Commission, which, of course, is a military one, asks that the Hackneys still in India be only used for the breeding of mares from which mules are to be bred.

There may be some ground for objection with respect to the Hackney as a sire for native mares, but from the accounts which have reached this State of the breed. the result of the introduction of the few Hackney entires which have been imported, but especially from the evidence adduced by Sir Walter of the improvement effected by the Hackneys which have been introduced in such large numbers for half a century on the continent of Europe, there is every reason to believe that their faults are greatly exaggerated by this Commission, that especially so of unsoundness, the breed being notoriously freer than the thoroughbreds from several of the faults with which they say the Hackney is affected.

However, the Hackney has plenty of friends, and I have no doubt that Sir Walter Gilbey or some of the other breeders, now that a copy of the report of the Commission is available, will take up their case and clear the breed of the aspersions which the Commission has, it would appear, recklessly brought against it. When they hear the other side of the question, our breeders, if they are now unable to do so, will then be able to make up their minds as to the value of the Hackney as a sire for light harness and saddle mares.

Before leaving the subject of the report of this Commission, it seems only right to call attention to some statements made to them at Calcutta by the shippers of Australian horses, and, to a certain extent at least, adopted by the Commission :—

(1.) *That Horse-Breeders in Australia are using inferior stallions.*

This is, no doubt, the case as regards the ordinary stamp of entire used by those who make no pretensions to breed for the Indian market, and also of some who occasionally sell to Indian buyers, but not as regards those who lay themselves out to breed for that market. They have had too much experience to use inferior entires, and the statement is much too sweeping, and should not have been made and published without inquiry.

(2.) *That our breeders are exporting the most of our best mares.*

No doubt many good mares were sold some time back, when horses were cheap, but not, as a rule, by those who were breeding regularly for the Indian and China markets; and now that good horses are bringing better prices, still fewer will be sold, especially when the effect of the losses from the drought is felt.

(3.) *That owing to the increased demand for South Africa and China, higher prices have to be paid for horses to India.*

Now that peace has been proclaimed in South Africa, this question of cost of freight will speedily right itself.

(4.) *That some members of the Commission have already observed deterioration in Australian horses, and that it is bound to increase rapidly.*

It is presumed that the deterioration observed in the Australian horses, seeing prices have risen in Australia, is not caused so much by the deterioration of the horses (except, perhaps, to some extent by weak condition through the drought) as through the buyers declining to give the prices asked by the breeders for better horses.

The object of the Commission in making this recommendation is to bring the Horse-Breeding Department, together with the Remount, back again into the charge of the Military Department, under a new department to be called the Imperial Stud Department, and then, while improving the existing system of Horse-Breeding, under which the Government provide the native breeders with entires, and purchase the best of their "get" for remounts, to lay the foundation of a breed of Indian horses and establish a stud-book. The Commission hold the opinion that a department constituted as they recommend would not only be able to carry out the existing (which has been called the "defensive") system in a much improved manner that would be able to gradually establish a breed of Indian horses, which would ultimately render the importation of Australian or any other horses unnecessary (except thoroughbred and Arab entires) either for native or Imperial remounts. They propose, with the aid of thoroughbred and Arab entires, to grade up some of the best native breeds to meet these requirements, and, ultimately, in sufficient numbers.

This would be simply reverting to the "Stud Department" which was established in 1794, and continued till 1876, when it was abolished on account of the expense, and recourse had to be made to the "diffusive system," as now carried out, and importations from Australia.

When, however, those who had the management of the Stud Department for over eighty years failed, after such a lengthened experience, to produce remounts which were, no doubt, of less value than the Australian, it is not very likely that the proposed Imperial Stud Department will be more successful, considering the class of native mares they have to breed from, and the deteriorating effect of the climate and other serious drawbacks, and if the recommendations of the Commission be adopted, there need be very little fear on the part of our breeders that the proposed breeding stud for the supply of Indian-bred remounts would affect the demand for Australian. The grading up of inferior stock to a better class is an undertaking which only men who are born breeders can successfully carry out, even in a good climate and under favourable circumstances, neither of which the Imperial Stud Department can command, and what with low percentages of foals and misfits, the cost of remount per head will far exceed its value—in the case, at least, of Imperial remounts.

Useful Australian Plants.

J. H. MAIDEN,
Government Botanist and Director, Botanic Gardens, Sydney.

No. 81.—*Ectrosia leporina*, R.Br.

Botanical name.—*Ectrosia*, Greek; *ectrope*, a turning off or aside; *leporina*, Latin, pertaining to a hare, referring to the softness of the panicle.

Vernacular name.—"Hare's-tail grass."

Botanical description.—(B.Fl., vii, 633.) A glabrous, slender grass, attaining 2 feet or more, but sometimes smaller.

Leaves very narrow, ending in subulate points.

Panicle narrow, dense, 3 to 6 inches long, the fine awns giving it much of the aspect of Triraphis mollis.

Spikelets crowded along the short erect branches, often purplish, the very short pedicels often bearing a few long hairs.

Outer glumes narrow, very acute, about 1 line long.

Flowering glume nearly as long, narrow, hyaline, one-nerved, slightly notched, with a fine awn nearly as long as the glume.

Terminal empty glumes usually two or three, smaller than the flowering one, but with longer fine awns.

Value as a fodder.—"A rather slender, dry, tufty grass; often attains a height of 2 feet." (Bailey.) But I have not seen it so large in New South Wales. It is ornamental, and is reputed to be a useful fodder grass.

Habitat and range.—Found in New South Wales and throughout Queensland and North Australia; an interior species in New South Wales.

REFERENCE TO PLATE.

A. Specimen collected between the Gilbert and Norman Rivers, Queensland.
B. Specimen of the type collected by Robert Brown about the year 1805.
1. Portion of panicle.
2. The outer glumes removed.
   a. Flowering glume.
   b. The terminal empty glumes.
3. *a.* Flowering glume.
   b. Palea.

ECTROSIA LEPORINA R Br

The Spekboom for Australia.

I HAVE before me papers showing the desire of Australians to get help by the introduction of some of our best stock-feeding, drought-resisting native plants, and surely, for helping in a drought-tried land, they could hardly apply to a better country than South Africa; one that, for countless ages, has had the grand work of evolution trying all forms severely, so that the fact of survival points at once to the adapted value of our native Karroo flora. Mr. J. H. Maiden, Government Botanist at Sydney, advocates the introduction of spekboom. Curiously enough, the information sent him by our Conservator of Forests, has these words:—"Spekboom is the universal name in South Africa, not the Boer name, as you put it." Then it is said by Mr. Maiden: "The natural home of the spekboom is in the Karroo;" and he is told by Mr. Hutchins in return: "I do not think it grows in the Karroo." That spekboom is native to the Karroo is well known to all who know anything about it. The earlier occupiers of Karroo were Dutch, and the fact that they gave the name to the bush, when they first met with it in the Karroo, is of itself good proof that the spekboom is native to the Karroo; and colonists after them have very naturally called the plant by the name given to it by the Dutch pioneers. Spekboom is widely distributed over the Karroo, not so much on the flats as on the rands or hills—rugged, stony crests showing up everywhere about the so-called Karroo plains crests that often carry special plants, because the intruded dykes below cause them to give soil different to much of the flats around them.

Spekboom is, therefore, very widely distributed and is very much valued, not alone as a stock food, but because it makes more useful to the animal the drier and more woody veldt plants they feed on with it. So valued is it that you rarely see it left out of the list of good things that are advertised to recommend a farm when it is for sale. Coastwards too, in some localities—as Mr. Hutchins says—it is abundant. In the bush which the railway traverses about Addo, and the northern slopes of the Zuurberg, it is, when in blossom, a pretty and common feature. It is said to be different to our Karroo form, and not cared for by stock so much. It is not a different variety, but the preference of stock for a certain food depends much upon locality and surroundings. Our dry Karroo makes a feed of succulent bush, such as spekboom, very appetising when found. On the slopes of the mountains around Graaff Reinet it is abundant. Our climate suits it well, being over 2,500 feet above sea-level, and frosts are rare.

I should be very sorry for our Karroo farmers if spekboom were not a native plant, and a very good native too, of the Karroo veldt.

Our Australian friends think they will be helped by the introduction of this valuable stock-food. I feel sure our farmers will gladly respond to help them. There are difficulties; the seed is peculiar, and very short-lived in transport. Mr. C. E. Lee, of Klipplaat, has taken great interest in spekboom propagation by cuttings. He says they should not be less than 2 inches in diameter, and are better for keeping 30 days, before planting, in a dark, cool, dry place. Such cuttings should stand export well. The spekboom, like most other succulents, does not part with its moisture easily, and does not dry out quickly; so that when a fair-sized branch falls on the ground, if the ground is at all favourable, it will take root like a prickly pear. The facts point to cuttings as the means of helping the plant to Australia.

I should like these notes on the introduction of spekboom to Australia to have a practical outcome, and should be glad to communicate with any Australians in the country who have friends at home interested in farming pursuits, and to receive any suggestions as to how to get the cuttings to Australia. Packed loosely in wood shavings in an ordinary case they would travel well, although the leaves would drop off. But experience has shown that a dexterous gardener can strike little plants from the leaves in sand, and so largely increase the number of plants sent over as cuttings. The coast spekboom is considered more brack in flavour, and is not so much relished by stock. But probably the difference of soil and climate has much to do with this, as Mr. Lee informs me that the brack cuttings, when cultivated in the Karoo, are eaten by stock as readily as is the other. If this is correct, then cuttings from the coast plants might be safely taken.

I trust that the authorities will help when the transports carry men to Australia, and so speed the plough, or rather, spread the spekboom.—WILLIAM ROE, senior, Graaff Reinet, Cape Colony.—[We shall be glad to be the medium of correspondence as suggested by Mr. Roe.—EDITOR.]—(*Agricultural Journal of the Cape of Good Hope*, May 8th, 1902.)

MR. MAIDEN furnishes the following note on the above letter:—"The articles of mine referred to are entitled—'A fodder-plant for the arid interior (*Portulacaria Afra*, Jacq.),' which appeared in the *Gazettes* for July, 1897, p. 450; and for October, 1901, p. 1200. I do not think it necessary to take advantage of Mr. Roe's very kind offer to send spekboom cuttings to Australia, as we have it well established in New South Wales. My offer to supply cuttings was not freely availed of, and *not one correspondent has reported his experience with the plant to me*. I simply do not understand the apathy of our people in regard to the introduction of new plants, except on the ground that they have been humbugged so often with wonderful plants simply boomed to sell. Mr. Roe's letter is an instance of the cordiality of the Cape people towards us, and we thank him for it."

Culture and Importance of Cotton.

JOHN MILLS.

THE cotton of commerce belongs to the order of *Malvaceæ*, generic name, *Gossypium*, and constitutes an important factor in civilised life. I was induced to turn my attention to its growth in New South Wales with a view to test the suitability of the climate, and after a period of thirty years I feel convinced that splendid cotton can be grown in this State.

The plot of land on which I have been successful in growing cotton since the year 1872 is portion of the vegetable garden attached to my residence at John-street, Ashfield. What I have done on this small experimental scale could, I am sure, be successfully carried out as a commercial undertaking, since the high quality of the article which can be grown in our climate would amply recoup the rather heavy expense of harvesting the crop.

During the American War, when millions of acres of cotton were destroyed, causing widespread distress and starvation in England, and perhaps all over the civilised world, the Government of the day imported cotton seed and distributed it to all those who would undertake to plant a small portion of land to test its suitability. I availed myself of the offer, and am pleased to say that my efforts were crowned with success, for I exhibited two samples, viz., Sea Island and Virginian, and received great praise for them, they being pronounced exceedingly good.

During the continuance of the war, cotton brought the fabulous price of 4s. 6d. per lb. (I merely mention this to show how necessary it is to provide against such an awful contingency as a war taking place again in the great cotton-producing country of the world), a price which could not possibly be maintained, for as soon as the war was over it came down to its normal price, at which price I believe it will pay to grow, and from that time to the present I have not only been growing cotton from the seed supplied by the Government, but have been very successful in producing new kinds which I believe to be good.

Soil.

I may say that scientifically it is stated that cotton requires nitrogen, phosphoric acid, and potash, and I admit that my land is in good heart, but to familiarise those who might be induced to grow cotton I may state that where good cabbages, cauliflowers, corn, or potatoes will grow, profitable crops of cotton can be produced.

Cultivation.

The land having been procured, anything deficient in the soil can be ascertained from the Department of Agriculture free by sending samples for analysis. When the required constituents are added, and the land brought into fine tilth, the seed can be sown in rows 2 feet apart, three seeds in a hole to ensure against missing, to be afterwards weeded out, leaving the strongest plant, the alleys (in mine) 3 feet apart, in field culture 4 feet apart to allow for weeding, and after the plants get into the rough leaf there is very little attention necessary other than keeping the ground free from weeds. I have stated before that where good vegetables will grow cotton can be produced, and with this advantage, viz., in very hot or dry weather when shallow-rooting crops would be destroyed, the cotton plant, owing to its tap root, would flourish.

Time of Sowing the Seed.

My cotton sown on the 1st October appeared above ground in about ten days, the first flower 17th December, and the first boll open on the 9th March, and by the middle of May the crop was nearly all gathered, which compares favourably with America, where the average of growth is eight months.

I may state that the three samples I sent to England for report were valued at the maximum price, viz., 6½d. per lb., and, further, that at last year's Exhibition I was pleased to learn the samples received a deal of attention from the visitors, the cotton being considered to be equal to any grown in other parts of the world.

In conclusion I might state that the order of *Malvaceæ* abounds in plants of utility and beauty, including the humble marshmallow, the stately hollyhock (*Althæa*), *Hibiscus roseum*, of our shrubberies, *Hibiscus esculentum* (Okra) a useful vegetable, and *Hibiscus tiliaceus*, of which cordage, rope, and fishing-nets are made, and other useful plants, but they are all left far behind in importance to the world by that wonderful plant—Cotton.

Protecting Trees from Hares and Rabbits.

Mr. Jas. Alford, Orchardist at the H. A. College, in answer to a request for information as to the best means of protecting young fruit-trees from the attacks of hares and rabbits, reports :—Blood smeared upon trees as high up as rabbits can reach will keep them away. The operation will have to be repeated about every month. Liver is also very good to smear the trees with.

Another simple wash can be prepared as follows :—Fresh cow dung, 1 peck ; quicklime, ½ peck ; flowers of sulphur, ½ lb. ; lampblack, ¼ lb. Mix the whole into a thick paint with urine and soapsuds. Paint trees as high up as rabbits can reach.

Bunt Experiment at Coolabah Farm.

R. W. PEACOCK.

An experiment, in order to gain some idea of the efficacy of some of the treatments for bunt, was carried out at this farm during the season of 1901.

The grains were carefully selected and divided into lots of 100 each, and sown 6 inches apart in a continuous drill. The bluestoned Hudson's Purple Straw of No. 1 was taken from the bulk of that variety as treated in ordinary practice at the farm, the treatment being as follows:—

The solution was made of the strength of 1 to 4; 4 lb. of bluestone being dissolved in 16 gallons of water. The grain was divided into half-bushel lots, placed in chaff sacks and immersed in the solution, which was frequently stirred up to allow the bunt balls to rise to the surface and to be skimmed off. The time occupied at this would be from five to ten minutes, it depending upon the number of bunt balls. The grain was then taken out to drain, and was thoroughly dried before going through the seed drill.

No.	Variety	Treatment	Grains sown	Grains germinated	Bunty.	Free.	Remarks.
1	Hudson's Purple Straw. From Bulk.	Bluestoned; not infested.	100	78	...	78	A few were eaten by galahs just as they appeared above ground.
2	Steinwedel ..	Not treated; not infested.	100	90	..	90	
3	Do .	Infested; not treated.	100	88	31	48	Nine doubtful; didn't come to ear.
4	Do	Bluestoned; not infested.	100	91	..	91	
5	Do ..	Infested and bluestoned.	100	92	..	92	
6	Do ...	Infested after bluestoning.	100	88	4	84	
7	Do ..	Infested, bluestoned, and washed with water after.	100	91	...	91	
8	Do ..	Infested, and treated with hot water.	100	82	.	82	
9	Do .	Treated with hot water; not infested.	99	87	...	87	One grain burst.
10	Hudson's Purple Straw.	Bluestoned, and afterwards infested.	100	74	7	67	

The Steinwedel, which was bluestoned, was treated in the solution used for the bulk wheats, which was kept to the same strength by the addition of fresh bluestone and water to allow for the waste in treating the bulk lots. Those treated with hot water were immersed in water kept at a temperature of 130° to 135° F. for fifteen minutes, and afterwards dipped in cold water.

It will be seen that the bluestone treatment, and also that of the hot water, were decidedly effective after infesting the grain. It will also be noticed that the treatment with bluestone, apparently, did not affect the germination. The infested grains of Steinwedel produced a large proportion of bunty plants. Those infested after being bluestoned produced four and seven bunty plants, and are suggestive of the damage which is possible by turning the wheats into sacks containing bunt spores after treatment, and also whilst passing through the machinery. In practice it is wise to immerse the whole of the sack in the solution whilst treating.

The large percentages germinating, and the effectiveness of the bluestone and hot water treatment, were somewhat surprising.

Common or Old English Rye.

Rye is a crop which is deserving of more attention than is generally bestowed upon it. It has the reputation of thriving where other cereals find it hard to grow at all, and as an example of this readers are referred to the illustrations on the opposite page. The samples of rye, and of rye and tares, shown therein were taken from a crop grown in pure sand at the Government Labor Depôt Farm, Randwick, which is exposed to the southerly winds—so severe at times as to blow plants clean out of the sand, in which their roothold is at the best of times not too secure. Concerning this crop, Mr. F. C. King, Superintendent of the Depôt, reports:—

This crop was sown on the 8th of April last, and grew remarkably well through the dry season. Only a few points were recorded on the 22nd, 28th, 29th, and 30th April; on the 25th April light rain fell throughout the day. During the month of May slight showers were recorded on the following dates: 1st, 2nd, 18th, and 23rd; while during the month of June only four showers were recorded on the following dates: 2nd, 12th, 13th, 26th, which was not sufficient to keep the sand from flying. The only cultivation given after the crop was up was to stir the sand with the ordinary garden hoe, which is a great help to any crop. Cutting of the crop was commenced on the 9th of June for green fodder, which was 2 feet high, for horses, cattle, and pigs, which is much relished. The greater portion of the crop has been saved for the straw, which makes excellent material for stuffing mattresses, horse collars, thatching, &c. When the grain is ripe the crop will be cut, and further details furnished in another issue of the *Gazette*.

Specimens of Common Rye and Rye and Tares grown at the Government Labour Farm, Randwick.

Artificial Hatching and Rearing of Poultry.

ROBT. A. M SOLOMON.

EGGS that are to be used for hatching should, as far as possible, be new-laid; the fresher they are, the higher the percentage of chickens. They should be collected as soon as laid, so as to ensure them from being exposed to the sun, or sat upon by a broody hen, thus causing the germ to start growing, spoiling the egg, and causing loss and annoyance.

Eggs from none but absolutely healthy fowls should be used; never breed from fowls that have disease of any kind, and never mate weedy fowls; the chickens will be weedier still.

The eggs, if kept, should be turned every morning, except the morning before putting in the incubator. It is a matter of opinion which end the egg should rest on; for myself, I do not think it is of the slightest consequence.

Place the incubator where there cannot be any vibration, start it a few days before putting the eggs in, so as to get it in perfect working order; when the machine is at about 100° put in the eggs, and allow it to work up to 103°, slightly increasing this temperature towards the end of the hatch.

Do not open the drawer till the third day, then turn the eggs morning and evening regularly by taking out the front one, rolling the second one towards you, and so on, till the last one in the row is reached, the front one then being put right at the back.

Test either the fifth or sixth day according to experience, to see which are fertile; the infertiles may be used for cooking.

A candle and one's hands are better than any machine. Hold the egg in front of the candle, having no other light in the room; if it has a live germ it will resemble a long-legged spider; if a black spot, either fixed or floating, with no veins, it is no good, either for hatching or eating; if perfectly clear, it is good for cooking. Testing a hundred eggs should only take a few minutes; it is far better not to fill up the machine, as chickens, being hatched at different times, inevitably cause loss by affecting those eggs which are not due for some time.

There are so many conflicting opinions *re* the amount of moisture to be used that I can only say that the poultry-farmer should use his intelligence and judge what amount is required by the moisture or dryness of the atmosphere, and also by the size of the air-chamber of the egg.

Keep the lamp well trimmed. If it smokes, lamp-black will be formed and prevent the proper amount of heat from reaching the water.

When chipping starts do not keep opening the drawer; open it just often enough to take out chicks, and to turn any eggs up that have

rolled over with the chip underneath. Put the chicks in the drying-chamber till dry, then into the foster-mother at a temperature of about 98° to 100° for first few days, gradually lowering till they are ready to sleep outside.

Have clean sand about 2 inches deep on the foster-mother floor; it is soft for their feet, and they will eat it almost at once, which is a great help to them. Clean off the top layer every morning and add fresh sand. Do not feed till they are from 30 to 36 hours old; they will not have exhausted all the yolk till then, and will be getting hungry and should be no trouble to feed. This is very important.

The first feed should be coarse oatmeal well scattered; feed little and often, say every hour for the first few days, then gradually lessen the number of meals. Never leave food lying about, as it quickly turns sour and will give the chicks diarrhœa, and very often cause death. Water need not be given till the second day.

Rolled oats is an excellent food, so is maize-meal mixed very dry with a little pollard; fine cracked corn, cracked wheat, a little cooked rice, canary-seed, stale bread are all good food for chickens; they will relish a little finely-chopped meat twice a week. Give green food as soon as they will eat it, and give plenty; lettuce is the finest green food, and they will eat it when they will not touch other green stuff. The food should be mixed fairly dry, never sloppy or stiff, and not too much soft food given; they thrive best on a ration composed chiefly of hard food. Bonedust should be mixed with soft food twice a week, which will prevent leg weakness in the heavier breeds. A little salt is also important. Fine grit should be given, the water always kept perfectly fresh and clean and in the shade.

Reduce the temperature gradually in the foster-mother, putting the chicks out every day in fine weather as soon as the dew is off the ground, and if the sleeping-house is warm, draught-proof, and damp-proof they can be put outside for good when they are from 5 to 7 weeks old, of course taking the weather into consideration.

Do not stint them till they are well grown and you will reap the benefit by having fine plump cockerels, which will fetch top prices, and pullets that will lay and will not suffer by laying too young. Separate the sexes as soon as they can be distinguished, more especially in the lighter breeds.

If a chicken is sick, unless a very valuable strain, kill it; better for it and its owner. Never attempt to rear chickens that are hatched malformed or weak; *it never pays.*

It is advisable to feed in long troughs, so that the weak have as much chance as the strong. Never coddle chickens; keep them dry and scrupulously clean, warm, not hot, feed as advised, and if hatched from strong, healthy birds, not inbred, the breeder should be able to say that 98 per cent. of all chickens hatched strong and vigorous can be reared.

Ensilage: Its Importance to the Dairy Farmer.

By S. P. PADDISON,
Manager, Oakey Creek Dairy Company, Limited, Rylstone.

In passing through the present severe drought, with its consequent ruinous losses to the dairy farmer, every person connected with the dairying industry of this State should in duty bound cast around for the most efficient means—by fodder conservation—for checking the ravages of bad seasons in times to come.

To those who have made a study of our annual rainfall, it is a well-known fact that at certain periods a drought is liable to occur. Taking the history of the State from the earliest settlement to the present day, one meets with (in a more or less acute form) the word drought. We may then take it for granted that the same thing will occur again.

Let us then see what the average dairyman might do to provide fodder for a time of drought.

Speaking from a personal view-point, I may state that in my experience (in several parts of the State where dairying is carried on) few, very few, dairymen have more than enough food to carry them through the winter. If then a few months of disastrous drought precedes the winter, their fodder supply runs out. Then (as now) the price of butter advances by leaps and bounds, and the factory supplier, unable to provide food for his cows, is compelled to cease milking at the very time, when above all others, his labour would realise the best cash reward.

The leading dairy experts of the Colony are all agreed that ensilage is the very best fodder to feed dairy stock on.

Here one is tempted to ask, how many of our dairymen have an ensilage pit? The answer is at present not more than one in fifty.

In perusing a late issue of the *Farmers' Co-operative News*, I read that, "a Mr. Yabsley, farmer, of Coraki, last week opened his silo which was covered up twelve months ago when feed was plentiful. He has now tons upon tons of the very best fodder."

In an ordinary good spring there are on every river flat, grass paddocks where tons and tons of clover, trefoil, &c., go to waste. Were a progressive dairy farmer to erect a silo and cut this grass and convert it into ensilage, a few good milk cheques would await him when next a drought occurred.

As to the best material for making silage, most experts agree that green cobbed maize ranks first. To those, however, who are situated on land unsuitable for maize-growing, it should be added that any green crop containing a large percentage of saccharine matter will make excellent silage.

When feeding upon ensilage there is practically no waste; every scrap being eaten. Herein is another advantage over the ordinary method of feeding upon harvested crops.

With a silo holding enough ensilage *pro rata* to the herd of cows, a dairyman could deliver at his factory throughout the winter months, quite two-thirds of the quantity of milk he delivers in the summer. For this he will certainly obtain more money than he received for the summer's milk. Hence his milk cheques will show little variation from year's end to year's end, instead of about one-tenth of the amount which usually prevails in winter.

The advantages to be derived from having a store of good milk and butter producing fodder in times of drought need not be enlarged upon.

Dairying is fast becoming the principal industry of this State; by food conservation,—in ensilage form—it will be by far the most profitable to the man on suitable dairying land.

To those who hold shares in a co-operative butter factory it should be borne in mind that nothing will advance the factory as much as a good uniform milk supply all the year round. To produce this uniform supply should therefore be the aim of the supplier. A ration of ensilage for the cows will do this better than anything else.

The keynote of success for the dairy farmer is good cows and good feed. Weed out the unprofitable cows by means of the Babcock test, and have a well-filled silo for the times when other fodder is scarce.

CATCH CROPS.

THERE is scarcely any more profitable branch of farm work than the planting in odd corners and during slack times of little patches of what are commonly called catch crops. The things available at all seasons for such purposes are innumerable. It is doubtful whether anyone could make a living by this sort of farming alone, but the odd £5 or £10 note that the seed or crops from some little patch cultivated on the off-chance will turn in is mighty welcome. The man who had the foresight to pop in a patch of cowpeas last spring, and has spent a few hours occasionally coaxing them along, can readily get his 7s. 6d. a bushel for well matured seed. Of course "catch crops" need not be limited to vegetation. There are times when eggs are plentiful, and so cheap that it is infinitely better to set them than to sell, and there are at times opportunities of raising a few extra pigs on produce that is finding a dull market, but which can be converted into pork at a 50 per cent. profit.

Fig. 1. -The Gooseberry Bush method.

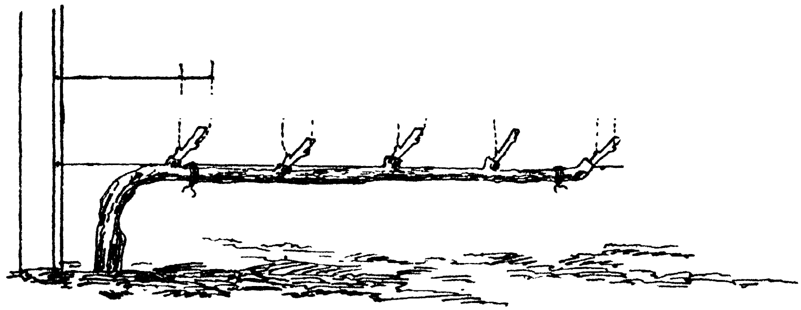


Fig. 2 --The Trellis System—cordons several years old, carrying spurs with two eyes.

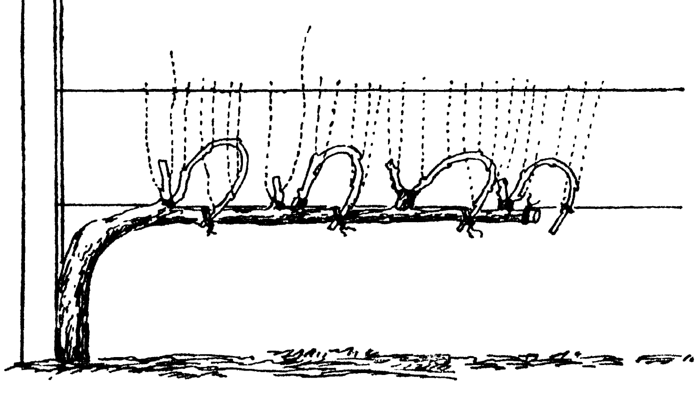


Fig. 3 --System of Cazenave, modified by Guyot --permanent cordons carrying 6 to 10 eyes.

Physiological influence of water on the fructification of Grape Vines.

M. BLUNNO.

THE dry weather which prevailed during seven or eight months, even in a district like the Hunter River, where vineyards never suffer through scarcity of moisture in the ground to the extent of sensibly reducing their output of grape-crop, should make the question of the physiological influence of water on the fructification of grape-vines interesting to vignerons, and it is thought that information on the subject may help them in regulating their pruning in the most effective way to ensure a good crop.

Very few have, perhaps, realised that the manner of pruning vines greatly depends on the quantity of rainfall, and, on the amount of moisture which the ground is capable of retaining.

For the better understanding of the practical conclusions to be derived from the principles that regulate the circulation of water in plants, I shall remind my readers that the standard systems of vine-pruning are two, viz.:—

(1) The gooseberry-bush method, consisting of vines with 3, 4, or 5 short branches, each branch carrying 1, 2, or 3 spurs, each spur with two eyes (short pruning). (Fig. I.)

(2) The trellis system, whereby one or two branches are carried over wire.

- (*a*) Trellises may have permanent branches, that is, cordons several years old, carrying spurs with 2 eyes, which is a case of short pruning again (Fig. II); or
- (*b*) The permanent cordons may carry canes with 6 to 10 eyes, and so have a long pruning. (Fig. III.)
- (*c*) The branches of a trellised vine instead of being permanent may be renewed every year and replaced with one or two canes of the previous year's growth, and carry over their length from 8 to 15 eyes respectively. This also is a system of long pruning. (Figs. IV and V.)

Generally, right through the vineyards of the Hunter valley you find trellises of class *a*.

In the Riverina the standard system of the gooseberry-bush (more or less the French *gobelet*) is generally in vogue.

Perhaps the German settlers about Albury are responsible for the more general adoption of this method, which is common also in the Rhine districts. A few growers, however, have with great success trellised their vines formerly pruned as *gobelet*.

In European vine districts a great campaign began several years ago in favour of vines trained on trellises, and the fervour for this innovation has not subsided. Once, about three years ago, M. Ravaz,

sounded a discordant note in the unanimity establishing the economical superiority of trellises over the old fashioned *gobelet*, even in relatively dry districts.*

He put forward a theory whereby vines and fruit-trees shoot under the pressure of water flowing from the soil through the roots up to the buds. Too great a flush would cause the buds to give strong sappy shoots with little or no tendency to bear; too weak a flush would not make the buds to open at all. He said further, that the circulation of water in a plant takes place according to the hydraulic principle of Piouille expressed by the formula—

$$Q = \frac{Apd^2}{l}$$

Q, being the quantity of water, A, a constant factor for every given liquid within the same capillary vessel, p, the pressure under which the water penetrates in the plant, d, the diameter of the capillary vessels of the vegetable tissues, l, their length.

A perusal of this formula would show that the greater the pressure of water contained in the soil, and the larger the diameters of the channels of the vegetable tissues, the greater would be the flow of water. On the other hand, the longer such channels, the less the volume of water.

Whoever would take this formula as the principle which should guide in the choice of a system of pruning according to rainfall, careless of important practical evidence, would *a priori* favour a system of trellises with long pruning (*class b*) in wet districts for these reasons:—

Because in *class b* the longer capillary vessels of the canes and the narrower channels and rough incrustations of the higher stem and permanent cordons, also the obstructions near scars, knots, bends more numerous on trellises of *class b* will check the great flush of water, and so dispose the buds to give fruit instead of a too vigorous wood growth without much crop.

Next to this he would give preference to *class a* and then to *class c*, very likely never to the method like the gooseberry-bush (*gobelet*).

But in dry districts he would choose the last named because the vine being shorter, the capillary vessels are shorter also, and although there may be, after a number of years, just as many knots and scars obstructing the free circulation of water, the flow of sap would undoubtedly be enough to start the buds into bearing canes.

Next to this he would prefer *class c* of trellises, then *class a*; *class b* would never be likely to commend itself.

But how far may Piouille's formula be taken as an absolute direction in choosing a system of pruning rather than another according to the amount of rainfall, or of the capacity of a soil for retaining moisture, we shall see.

That there is a law presiding over the circulation of water in plants I have no doubt. It might be that expressed by Piouille's formula;

* M. Ravaz's warning was principally directed to the vignerons of Southern France.

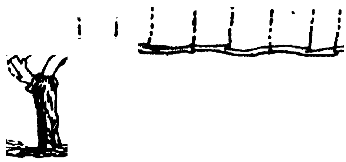


Fig. 4. System named after Dr. Guyot (simpie)

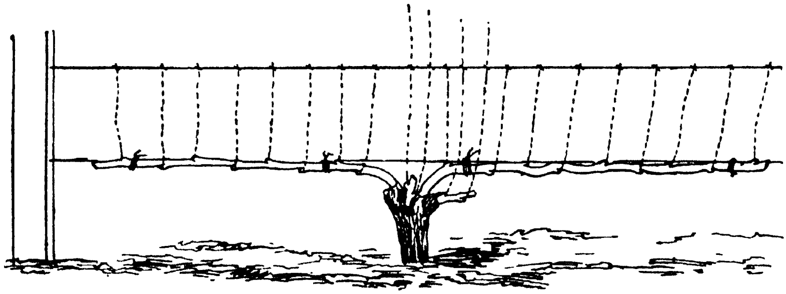


Fig. 5. —Double Guyot. In the Guyot Systems (simple and double) the branches may be renewed every year.

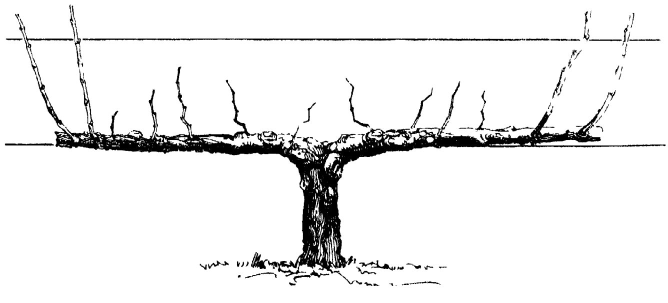


Fig 6.—Showing the effects of neglect to renew cordons and of excessive mutilation of the vine.

SYSTEMS OF PRUNING.

and it might not. Whichever it is, I cannot conceive that the flush of water through the capillary vessels of the plant is not modified by the physiological action of the tissues themselves. I mean we cannot compare the tissues of a living organism like the vine to a mere system of channels of inert material like glass or sawn timber any more than one could compare the circulation of a fluid in the latter with the circulation of blood in animals.

The buds of a vine or tree cannot shoot under pressure of water acting solely as a physical agent—as if it were forced up by a pump through the plant tissues. If it were so, buds should burst open any time during winter when, on account of the greater rainfall, there is a greater water pressure in the soil, and it would not be plain why these buds only burst open in spring; that is, when the soil and atmosphere have reached a certain degree of heat.

We have just witnessed during this prolonged drought and mild winter a fact which puts the factor heat before water as the main cause determining the bursting of buds into leaf. In spite of the dryness of the soil, but only through the influence of a mild atmosphere, many fruit-trees have burst into leaf in midwinter.

I shall draw my readers' attention to some other practical evidences militating against taking Piouille's formula as the absolute principle regulating the circulation of water in plants.

When a vine has been pruned on trellis with permanent cordons, and the vigneron neglected to renew them, or caused too many scars or bends, it is very common to see the middle portion of the cordon producing very weak, short canes, if any at all, while towards its far end one usually finds one or two vigorous canes which alone are relied on for crop or wood (Fig. VI). If Piouille's formula really regulated the circulation of water in a plant, then the weakest canes should be at the far end of the cordon in so far as, according to the mentioned hydraulic principle, the flow of water is in inverse ratio to the length of the channels.

Further, the buds at the top end of the cane are always first to burst, while those at the bottom end are the last. Here again, the eyes round the crown should be the first to shoot, and those at the extreme end of the branch, the last. Currant vines are grown in relatively dry and sunny districts; they are pruned, leaving long canes, and they bear plentifully.

M. Ravaz, however, does not underrate the importance of the fact that the position of the fructiferous buds on a vine cane is an important factor in selecting a suitable system of pruning, and he avers that the best for producing a crop are those not too close to the crown. In fact, the most proliferous are placed on the middle of the cane. But there are exceptions, and the Aramon with the Gordo Blanco, and several other varieties of Muscat carry the best cropping buds closer to the crown. These should be pruned short, either on the *gobelet* system or on trellises with cordons and spurs.

More reasons than one, I consider, have a direct or indirect influence on fructification. The pressure of water is undoubtedly one of the factors; the very old device of twisting, bending, or ring-barking a

too vigorous branch with the view of attenuating its tendency to grow wood and leaves alone, and forcing it to bear fruit instead, shows that a check of a too strong flow of water is beneficial in securing a larger crop.

The quantity of plant-food ready for root absorbtion is also dependent on the amount of water in the soil; on the other hand, if more plant-food than what is actually required for the needs of the plant is not available in the soil, the plant will not yield all that it is capable of, hence the necessity of fertilisers. Certain elements influence fructification more than certain others; *i.e.*, phosphoric acid, is considered as the ingredient predisposing a plant mostly to yield fruit.

The position of grape-bearing buds is also another important factor as explained in the foregoing; and, ultimately, a regard to the general economy of the plant which requires a judicious rubbing off of all non-bearing shoots unless they are particularly required, because of their position, next pruning season to form a new branch or for renewing an old one or extending another.

In districts where the rainfall is copious, or where the soil is capable of retaining moisture, or where the subsoil is rather impervious, or in grounds where drainage is defective the pressure of water and the force with which it ascends in the tissues is greater, it is necessary to adopt a system of pruning which will check, to a certain extent, the strong flow of water. Permanent cordons with spurs, *Taille de Quarante* (Fig. II), or with spurs and canes associated, *Cordons Cazenave and Cazenave-Marcon* (Fig. III), also the *Sylroz cordons* are recommendable.

In drier districts and drier soils a system of trellises and long pruning may still be adopted, but permanent cordons are not advisable. The long canes which have borne fruit should be replaced every year by the previous year's growth, *Guyot and double Guyot* (Figs. IV and V), or at least, every alternate year, in order to always keep young wood, the tissues of which are freer, straighter and without deformities that would offer obstacles to the ascension of the necessary amount of water to start, in conjunction with other factors, a vegetation responsible for a satisfactory crop.

The length of canes should not be exaggerated, vines rather closely planted will be pruned on the standard Guyot system, namely, a long cane with twelve to fifteen eyes and a two-eye spur; vines planted wider apart will be found profitable if carried on the double Guyot system, viz., two canes and two spurs, the canes being conducted in opposite directions on the same wire, every cane carrying nine to twelve eyes.

Such systems will be found answerable even in rather dry districts, and the vines will bear more than vines trained like gooseberry-plants, while the quality of wine will not be affected. It is opportune, however, to remind vignerons that heavier crops must always be followed by generous manuring with chemical fertilisers, also that green manuring in dry districts by ploughing in towards the end of winter, a crop of leguminous plants sowed soon after vintage will largely contribute to keep the ground open, storing a quantity of moisture easily retained during summer months, and rendering the action of fertilisers promptly effective.

The Nematode Formula.

By N. A. Cobb.

Some years ago I proposed, in a special article on the subject, a decimal formula for use in describing Nematode worms, and since that time have used the formula with ever-increasing satisfaction.

The leading idea in the proposed formula was the arrangement of the necessary measurements in a manner most convenient for the reader, all measurements being dated from the head end. At the same time one or two measurements were proposed that had not been previously used, at least systematically.

In order to facilitate comparisons it was proposed to make the unit of measurement one per cent. of the length of the worm, whatever that might happen to be. The final term of the formula gave the absolute length of the worm.

It can hardly be admitted that the construction of this formula is a more difficult matter than the making of the measurements formerly more in vogue; but even if that were the case, the call for its use would be none the less urgent, if it can be shown that it is the most convenient way for the reader. The author who consults his own ease rather than that of his reader will hardly meet with general approval.

Fig 1.—An instrument of much service in making measurements, not only of Nematode worms, but of any small objects, is easily constructed in the following manner:—Take an ordinary steel crochet needle, and break off about an inch of the hooked end. Cut a screw-thread on this broken-off end, and by this means attach a piece of ivory scale in the manner shown in the illustration. In the tool-box at my elbow, containing my dissecting instruments, lie several such implements of varying size and scale, and I find them often very serviceable. They may be thrust into spirit and some other fluids with impunity, and this fact adds to their utility. They serve also admirably for measuring under a magnifying glass a variety of small objects, as well as the dimensions of drawings and images on negatives.

A great recommendation of the decimal formula is that all the measurements are in the same terms. In consequence of this, it is possible to readily compare with each other the different parts of a given formula, as well as compare with each other the formulæ of various specimens and species. Contrast this ease with the perplexities that beset the reader when he is trying to compare with each other worms, *one* of which is said to have a pharynx one-twenty-third as long as the neck, a neck one-sixth as long as the body, a vulva located two-sevenths the length from the head, and a vent located one-twelfth the length from the end of the tail, and *the other* of which is said to have a pharynx $\frac{2}{25}$ as long as the neck, a neck $\frac{1}{4}$ as long as the body, and a vulva located $\frac{5}{7}$ the length from the tail end, and a tail as long as the distance

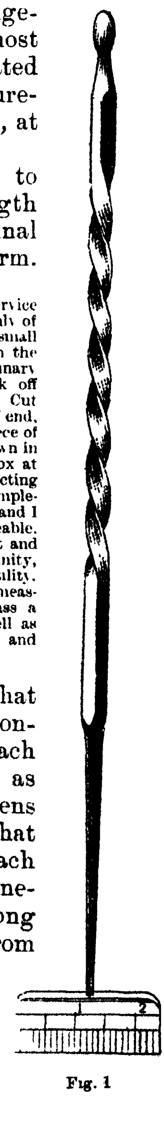


Fig. 1

between the vulva and the anus. If the reader's convenience is to be consulted no more than this, why not pi the type and hand it over to him with the remark, "There! it's all there somewhere!"

Convenience to the Reader.

At the time of proposing this decimal formula I felt that, as I had already used it for some years, and thus become accustomed to it, I was not a good judge of the difficulties that would beset a novice in its use. Time has brought to me expressions concerning the use of the formula that lead me to write a few words in reference to the methods I have found best in assembling its terms for a given species.

The matter of making measurements, though a minor matter, is one of necessity. The measurements embodied in the formula have always been given by authors in describing the various Nematode species. This fact proves that it is by giving certain measurements that some of the main characteristics of the species are most easily and clearly set down. Hence it is simply a matter of convenience what method of recording the measurements is adopted. That being the case, I think I may safely claim the decimal system to be the most convenient system, so far as the reader is concerned, and I find this claim to be substantiated in various kind and complimentary expressions with which my correspondence is strewn. Similar expressions have found their way spontaneously into the literature of the subject. I shall therefore confine myself to the little difficulties that have been mentioned as arising in making up the formula. A few words are added with reference to some uses of the formula that have come into prominence since the publication of the original paper on the subject.

To Construct the Formula.

The first step in constructing the decimal formula is to find out the unit of measurement. Any postponement of this step will not result advantageously. First of all measure the length of the worm, and divide the result by 100.

The initial difficulty is one that occurs in all attempts to measure a crooked object, such as a worm. While therefore this little difficulty is not one peculiar to this formula, it is one that will justify a word or two from one who has performed the operation thousands of times, and has therefore been driven to invent ways that might not at once occur to one of less experience.

The measurement of the length of the worm, almost always curved, and frequently coiled, is most easily accomplished by means of a drawing, if one has some little dexterity in that direction, as is almost always the case with naturalists nowadays. Produce a camera lucida drawing or a photograph, and then measure the drawing or photograph—that is the method to adopt in nine cases out of ten.

The drawing will naturally be made to some known scale; but if not, the formula can still be created if we except the last term, the absolute length.

To find the length of the drawing, take a pair of spring dividers having two sharp steel points, and set the points some known distance apart, say 10 millimetres. Do this by stepping off ten steps with them on a millimetre scale. In ten steps the dividers should cover precisely 100 millimetres. If they do not, then alter them until they do step off 100 millimetres in ten steps.

Now, supposing the drawing of the worm to be from 150 to 200 millimetres long, take the dividers as set, and step from one end of the drawing to the other, keeping carefully to the middle of the drawing, and keeping count of the steps. Seventeen and five-tenths steps means that the drawing is 175 millimetres long.

One per cent. of this length *gives us our unit of measurement*—namely, 1·75 millimetres. Next set the dividers to 1·75 millimetres. To do this, repeat the process by which the dividers were set to 10 millimetres namely, step off on the millimetre scale until by adjustment the dividers cover 17·5 millimetres in ten steps. That being the case, we may be certain that each step is precisely 1·75 millimetres long.

The rest is very easy. If the pharnyx takes two of these latter steps for its depth, it is 2 per cent. of the length of the worm in depth, and the corresponding term in the formula is 2. If the neck in that locality is one step wide, the corresponding term of the formula is one.

I insert here my original figure to give some idea of the various terms and their relation to the various features of the worm.

FIG. 2 Diagram in explanation of the descriptive formula used for Nematode worms, 6, 7, 8, 10, 6 are the transverse measurements, while 7, 14, 28, 50, 88 are the corresponding longitudinal measurements The formula in this case is:

$$\frac{7 \cdot}{6}\ \frac{14}{7}\ \frac{28}{8}\ \frac{50}{10}\ \frac{88}{6}$$

The unit of measurement is the hundredth part of the length of the worm, whatever that may be The measurements become, therefore, percentages of the length

The measurements are taken with the animal viewed in profile, the first is taken at the base of the pharynx, the second at the nerve ring, the third at the cardiac constriction (base of the "neck"), the fourth at the vulva in females and at the middle (M) in males, the fifth at the anus.

There is an instrument sometimes used by draughtsmen called a map-measure that may be used to measure curved lines. It was designed primarily for the measurement of distances by road on maps, but it may be employed on our formula with great convenience. The instrument is, however, somewhat expensive, the lowest price I ever saw quoted being $2.50, or ten shillings, for a well-made French pattern (see Fig. 4).

The method of stepping off the various measurements by first setting the dividers to 1 per cent. of the length of the drawing, is one that involves very little calculation.

To those who have a taste for arithmetic it may seem easier to make the various measurements in the usual way, and then *calculate* the percentages. This I frequently do when there is no pair of dividers at hand. It suffices to measure the length in some way, and then divide each of the other measurements by this number representing the length. The results are quotients representing the percentages used in the formula.

Convenience to the Investigator and Author.

It might be thought from the foregoing details that the construction of the decimal formula is a matter of some difficulty to the investigator; but I think it will be found that, with a very little practice,

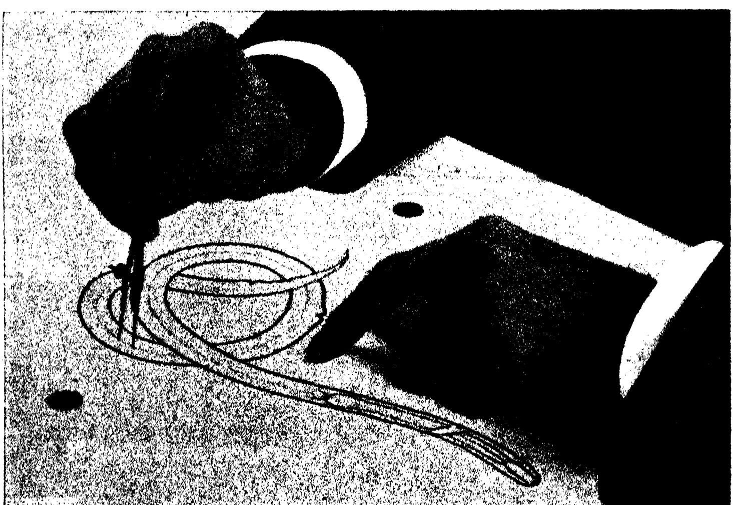


FIG. 3.—Measuring the length of the drawing. The head end of the drawing lies near the left hand cuff. The pharynx is shown, and near it, next the knuckle of the little finger is the nerve-ring. The cardiac constriction lies this side of the end of the forefinger, and the vulva on the farther side. Mention has been made of the error resulting from the attempt to measure a curved line with a straight measure. The aim should be to reduce this error so much that it can safely be neglected. One means of reducing this error has already been mentioned, namely, reducing the "step" of the divider legs in proportion to the sharpness of the curve to be measured. Another method may now be mentioned, but it is to be used with caution, and only as the result of experience. By a number of careful trials it will be found that a measurement nearer the truth can be obtained by following a path somewhat on the outside of the curves of the median line on the drawing or image being measured, but care must be exercised in adopting this method not to overshoot the mark. Where the curve is sharp it is of course safer to go *always* a little on the outside of the curve. I consider it to be sufficiently accurate after a little practice to dispense with actually drawing in a median line on which to measure. It is easy to keep sufficiently near the middle by eye. Of course, with a reliable map-measure all these difficulties disappear.

there is no loss of time when the decimal method is used, even in the construction of a single formula; and when it comes to the subsequent work of comparing measurements of various species, the advantages will be found to be vastly in favour of the decimal system.

It is by no means necessary to have a drawing to work from. A good photograph is equally satisfactory, and often more satisfactory. I have produced formulæ from photographic negatives many hundreds of times with the greatest satisfaction. It is a method involving a minimum of labour. Magnifications of 50 to 200 diameters are produced on negatives, and the measurements are made on the negative itself, without the necessity of making prints.

Care is necessary in mounting the worms to make sure that they lie as flat as is compatible with freedom from pressure that would flatten the worm. Any pressure would increase the diametral measurements, and introduce errors. In the making of negatives, however, it is essential to bring all parts of the animal into focus at one time, and to do this in the narrow working limits of the microscope objective requires the care here mentioned.

A mere camera lucida projection may be measured, and if one is expert in the use of the camera lucida, formulæ may be created in this manner quicker than by any other method. The projection is thrown by means of the camera lucida on to a piece of white paper, and its length, width, &c., are measured with the dividers in the same manner as if it were a drawing, the operations being performed under the camera lucida in much the same manner that a drawing is made.

Of course it is also possible to measure the various parts of the worm with an eye-piece micrometer, and thus secure measurements that may be used to arrive at the formula by means of the above-mentioned arithmetical divisions.

When the worm is coiled up in narrow spirals, it is necessary to have the dividers set to a shorter distance than might otherwise answer. They may have to be set as short as one to two millimetres in order to avoid the error that creeps in when a curved line is measured with a straight measure. It is necessary always to so set the dividers that the error introduced in this manner is so small as to be of no consequence.

Applicable to all Species.

It has been suggested to me that the formula is not so easily applicable to the larger Nematodes, and this is to a certain extent true. It is certainly most easily applied to the microscopic species, and it was while at work upon such species that its use first suggested itself to me. I have used it, however, with ease on large parasitic species, and I think its advantages to the reader are just as great for such species as for any others.

The trouble seems to be that it is not always easy to measure the various parts in such species. This, however, is a matter that applies to any system of recording the measurements of such species, and cannot therefore be urged as a special objection to the formula. Even in cases where it is found impossible to measure any particular part, it is still possible to give the formula, representing all missing measurements with a question mark. This I have sometimes had to do when obliged to deal with species whose dimensions are not fully known.

Museum specimens of Nematode worms are too often kept inviolable—one might almost say, sacred—on account of their being type specimens or rare ones. Often there is very little on the outside of a Nematode worm to indicate its nature; in fact, I should consider it a calamity if my large parasitic species should by accident get mixed, because it would be almost impossible to separate them again except at the expense of dissections, so much alike are the external appearances of these species.

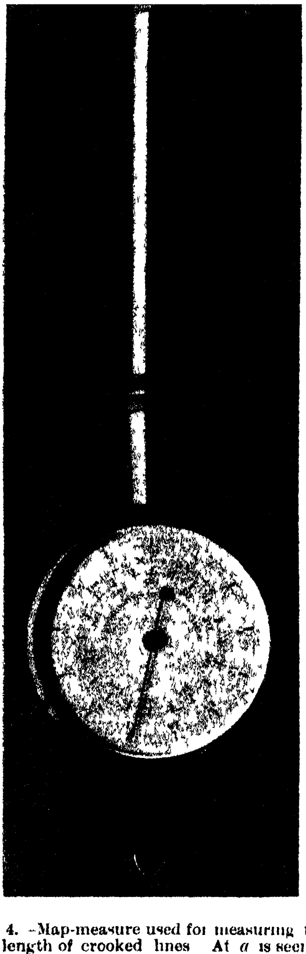


FIG. 4.—Map-measure used for measuring the length of crooked lines. At *a* is seen a small wheel which is rolled along the crooked line to be measured. This wheel is geared to the axis carrying the pointer seen on the dial. The pointer indicates the distance rolled off, and gives the result in inches or millimetres, the inner of the two scales being the metric scale.

It is, therefore, in cases such as I have just mentioned—namely, rare and unique or type specimens—that the objection may be raised that the formula is inapplicable. To tell the truth, I do not see that this is in reality an objection at all, the fact being, in my opinion, that all rare or type specimens that have not been examined internally should be so examined, and the sooner the better. Such specimens are insoluble riddles until dissected, and, as such, are of very little use indeed to science. When they are dissected they will as readily furnish data for the decimal formula as they would for any other method of expressing their dimensions.

It is, however, true that certain outstanding species, and among them some large parasitic species, offer problems that defeat the formula. These, however, are usually problems of structure rather than problems of expression, and should not be allowed to in any way hinder the use of any convenient means of expression that is applicable to the vast majority of cases.

However inapplicable the formula may be in certain very rare cases to the adult worm, there are no instances in which it is not applicable to the larvæ. These latter are always of the form most suitable to the formula, and from this it follows that, in the strictest sense of the word, there is *no species to which the formula is not applicable.*

If these facts be borne in mind, I think the formula will be found to gain still further favour, and become as useful in connection with Nematode worms as the dental formula is in connection with Vertebrates.

Generic Formulæ.

I would like to call particular attention to the fact that by averaging the formulæ of the members of a genus it is possible to arrive at a *generic formula.* If this averaging is done with discretion the results are highly suggestive, and lead to depths of insight not otherwise easily reached.

An objection has been suggested to me in connection with the use of the signs employed to indicate the size, form, and position of the internal sexual organs. For this purpose, commas and dashes and small exponent figures are used, and it is of course possible that these may fail to print. In that case, and if at the same time there was no other indication in the description as to these same structures, the danger of misconception from the use of so trifling a mark might be admitted. It is sometimes the case, however, that there is to be found elsewhere in the description nearly or quite all that is expressed by these signs in the formula. I think that I may set up against this slight objection the fact that I do not know of a single case among all the hundreds of thousands of imprints of formulæ in Nematode descriptive matter where any mistake or misconception has occurred. From this it appears that, with care in the proof-reading, there need arise no difficulty worth serious attention.

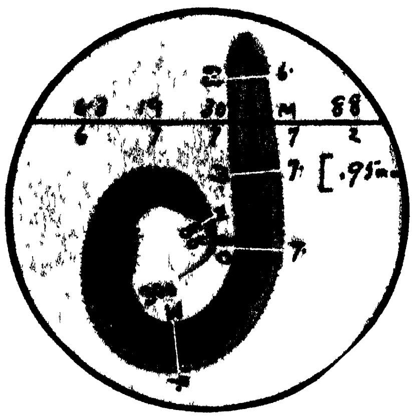


FIG. 5. Negative with image of a worm that has been used to calculate a decimal formula—

6 3 19 80 M 88

I have been brought to task in one of the world's most valued scientific journals for publishing original matter in which I made these formulæ play a rather prominent and unusually responsible part. Together with illustrations of unusual excellence, they were made the sole vehicle to announce the discovery of new species and genera. It seems, however, that my sin consisted in publishing such announcements in a paper devoted ostensibly to assisting novices to gain a more ready insight into the intricacies of Nematode anatomy. At the time of publication I felt that an apology was due for such a procedure, and did penance beforehand. If any further apology is needed it is hereby offered, with the assurance that the circumstances that led to the course adopted on that occasion are not again likely to arise.

I think the friendly observations on the article referred to were meant not so much as a criticism of the nature of the descriptions offered as of the association of two incongruous forms of writing—an opinion confirmed by the fact that, with the aid of the formulæ, the descriptions were more complete, compact and clear than is often the case with Nematode species.

Formula in itself a somewhat complete Sketch.

The convenience to the reader consists in the readiness with which, having the formula before him, he can construct in his mind's eye the main features of the anatomy of the worm. After a very small amount of practice and study, if one may dignify such a trifling mental effort by the name of study, the reader is able to see in the formula at a glance an accurate, compact, and somewhat complete sketch of the species, one that frequently is sufficient for systematic purposes.

The greatest objection that can be raised to the formula is, in my opinion, the conservative objection. It had not been used in the past. This objection was one that gave me a good deal of thought, and it was only after using the formula for a number of years that I ventured to publish a description of it and to introduce it into my own writings on the subject of Nematodes. In doing this I was fully aware of the force of usage and the respect due to it. It was with no little regret that I found my own writings differing from those of my contemporaries in the matter of expression, for I knew well the misconstruction that might be attached to such differences.

However, every new thing that comes into use has to meet such objections and run such risks. I am glad to know that the present small innovation has secured the approval of so many progressive students and investigators.

Finally, I would like to be permitted to add, that I have written these paragraphs solely because I believe that, apart from any idiosyncrasy of mine, the formula is a genuine help in the description of Nematodes, and worthy of the universal adoption it promises to secure—it is above all a convenience to the reader, who is, after all, the *raison d'être* of publication. According to my experience it is also of great utility to the investigator and author.

Eggs containing Abnormal Bodies.

In answer to a correspondent who submitted a fowl's egg containing several abnormal bodies, Dr. Cobb reports :—

Mr. J. H. Roulston, of Travers-street, Wagga Wagga.—The single hen's egg sent contained several abnormal bodies having a somewhat clotted appearance and a reddish or brownish colour, and measuring two to three millimetres across. These bodies upon examination with the polariscope, combined with a chemical test, proved to contain numerous aggregations of carbonate of lime. From this fact I conclude that the walls of the egg-sack of the fowl producing the egg are in an unhealthy condition accompanied by ulceration of the shell-secreting area. A *post mortem* would be necessary to definitely decide the matter. It would seem, however, that some of the diseased portions, becoming detached from the shell gland, are included in the egg. Such appearances are not exactly uncommon in hen's eggs, but it is uncommon to find as many such bodies in a single egg as were found in the specimen submitted. Such eggs may be safely used for food, but I would recommend the removal of these bodies from eggs eaten raw, and it would be a reasonable precaution to thoroughly cook eggs containing such bodies when the eggs are to be used as cooked food. Fowls showing this trait prominently can be easily singled out from small flocks by a little observation, and disposed of, and this course would be advisable.

Internal Structure of the Gall-worm.

By N. A. COBB.

SINCE writing the previous article on the gall-worm, I have had occasion to examine, on different occasions, good specimens of root-gall from various parts of Australia, and from several foreign countries. The pest occurs in Japan, as is shown by the results of inspection of imports under the Vegetation Diseases Act of this State. I am not aware that the disease has been before recorded from that country. It also occurs in China, as has been proved from examinations originating in the same way. Samples have been submitted to me from those countries, through the vigilance of Mr. Inspector Martin. The roots found to be infested were those of the yam.

One cannot help wishing that this beneficent law had been in force long ago. An earlier application of our scientific knowledge might have saved this and the other States of the Commonwealth a vast sum of money in connection with root-gall alone.

The result of my recent examinations is to throw some additional light on the structure and relationships of the worm causing the disease. Briefly, it may be said that these new observations corroborate those made by Atkinson in Georgia.

Males taken from parsnips, &c., from the Richmond River Experiment Farm, were put into the differentiator and passed through alcohol and Mayer's carmine, after being fixed in hot sublimate solution. This method gave a very slight stain to those specimens that had a whole skin—barely enough to facilitate examination. Specimens that were cut in two stained more strongly. From absolute alcohol the worms were passed into a solution of carbolic acid in absolute alcohol. They were thus well cleared.

a, lips

b, œsophageal tube.

, median bulb.

d, excretory pore

, spear

f, intestine.

, blind ends of testicles.

h, testicles.

i, spicula.

rudimentary bursa

k, anus.

Fig 1. The male of *Tylenchus* (*Heterodera*) *radicicola* I, worm in profile view. II, head of the same more highly magnified. III, middle region of the worm to show blind ends of the sexual organs IV, posterior extremity. The drawings were prepared from stained specimens, examined in carbolic acid solution.

Examination proved that the males are possessed of a double internal sexual apparatus. The appearances are often somewhat deceiving,

and it would be easy in some cases to so mistake them as to arrive at the conclusion that the internal sexual apparatus is single.

When both sexual tubes extend directly forward throughout their length, as is sometimes the case, it is not difficult, at least in stained and cleared specimens, to demonstrate the presence of both. When, however, as is often the case, one of the tubes is reflexed, the appearances are such as to closely simulate the simple male apparatus exemplified in most, if not all, the known species of *Tylenchus*.

The sexual tubes are comparatively slender, and when they lie side by side and in contact it is rather difficult to separately observe them, even with the most careful focussing.

Even when both organs extend forward, often one of them is reflexed near the extremity. When one of the organs is entirely reflexed it is usual for it to be more or less coiled, and thus difficult to follow and completely locate. In the specimens examined, the reflexed condition was about as common as that in which both organs extended forward. The formula thus presents an alternative middle term (–M– or =M). The formula is $\frac{1\ 1}{1\cdot1}\ \frac{8}{1\cdot4}\ \frac{13\cdot}{1\cdot6}\ \frac{M}{2\cdot5}\ \frac{99\ 2}{1\ 2}$ 1·5 mm.

On structural grounds I formerly regarded the genus *Heterodera* as of questionable validity. The present observations have rendered less tenable the ground I formerly took up; but I see no reason for abandoning the position until it shall have been shown that the males of *Tylenchus* in all cases have a single instead of a double internal male apparatus. We are in complete ignorance with regard to the males of a considerable number of these species, and it may fairly be doubted whether the observations on the known males have been sufficiently careful to warrant us in regarding them as without exception unitesticulate. Should it be found that all *Tylenchi* are unitesticulate it would be hardly possible to deny the validity and usefulness of the genus *Heterodera*.

As to the internal structure of the testicles, little that is new or interesting was observed. The blind end in each organ is occupied by a special cell, and from thence the mother-cells of the spermatozoa extend onward in a single row, or approximately so, throughout the length of the testicle proper. The change by division to spermatozoa occurs near the proximal end of the organ. In the seminal receptacle, formed by the junction of the hitherto separate branches of the apparatus, the spermatozoa are arranged in several rows, and the vessel is of such a size as to occupy the greater portion of the lumen of the body near the posterior extremity. The ejaculatory duct appeared to be quite short. Most of these details are carefully set forth in the accompanying illustrations.

The species referred to the genus *Heterodera* are, in my opinion, *Tylenchi* in no great degree remarkable for their departure from the normal form during part of their existence.

I am confirmed in this opinion by the presence of a rudimentary bursa, which has, it appears, been hitherto overlooked on the living specimens, but which can be easily observed on the specimens now before me. In these examples the wings at the posterior extremity of

the male are distinctly modified to produce a small bursa-like expansion, which certain muscles of the body, by flattening the posterior extremity, no doubt convert into an efficient copulatory organ.

If the males alone of this species were known, it would no doubt be classed as a *Tylenchus*, notwithstanding the double testicle. The young of either sex are typical *Tylenchi*. The adult female possesses double sexual organs, but so do those of a number of *Tylenchi*. The justification for *Heterodera* therefore rests, in the main, on the excessive development of a single set of organs late in life in one sex, and this development consists almost solely in an increase in volume—there is no important change in form, much less in structure.

It will be interesting in future to give close attention to the internal sexual organs of male *Tylenchi*, with a view to settling definitely whether they are single or double. As I have before pointed out, the occurrence among nematodes of double symmetrical internal male organs is much more common than was formerly supposed, and perhaps bids fair to prove the rule in free-living species.

Lucerne for Ensilage.

The first cut of lucerne very often is foul with weeds and inferior grasses which spoil it for haymaking; also the weather is often unsuitable for haymaking when it is ready to cut. Under such circumstances it would be wiser to make the lucerne into ensilage which would allow very often of its being cut earlier, thus giving the next crop for haymaking a better and earlier start. It cannot be cut and carted too green and succulent for making silage. It also can be carted during weather which would ruin it for hay purposes. Lucerne can be profitably made into silage in the stack if suitable pressure be placed upon it. The larger the quantity treated the smaller the proportion of waste at the outside of the stack.—R. W. Peacock, Bathurst Farm.

Doubling the Value of Manure.

After an almost continuous experience with a manure spreader for over eight years, I feel justified in saying that it will pay any farmer having from 150 to 200 loads of manure per year to buy a spreader. When used to top-dress growing crops or prepared fields before planting, I have found that the decidedly better mechanical condition in which the machine places the manure on the ground increases the producing value of the material by fully 100 per cent. by rendering every particle more immediately available as plant food, and giving a perfectly even distribution over every inch of surface. Therefore, if the grower is enabled to get twice the fertilizing value from his manure by the use of the spreader, the increase on even 100 loads would pay a satisfactory dividend on the investment.—R. M. Winans, Lake County, in *American Agriculturist*.

Pruning.

(Continued from page 958.)

W. J. ALLEN.

The Quince.

THIS fruit is largely grown throughout the State, and in particularly large quantities along our rivers and on low spots where other fruits will not do. In most cases the tree is planted and allowed to look after itself, with but little if any pruning towards shape, but occasionally a few of the suckers and long straggling branches are removed; and in this way are grown the largest proportion of quinces which find their way to our markets. When the fruit is grown in orchard form and cultivated it will be found better to follow a regular system of pruning, and to do this it is best to begin while the tree is young, and cut back to a single stem as in the case of other fruits, and from year to year increase the number and length of the arms in proportion to the growth made by the tree. In our Government orchards we have found that by following this system good results have been obtained, and although we have cut back almost as severely as we do the peach, we find the trees setting all the fruit which they can possibly carry and properly develop. If too much fruit is allowed to set, the natural consequences ensue—that is, the fruit is small and of poor quality, and of little use to the jam or jelly maker as compared with the properly grown fruit.

Where the tree is left without proper pruning the fruiting wood will be found well out towards the terminal points of the laterals and not where it is to be found in a properly pruned tree.

Heading-in thins the fruit, as the flowers spring from the terminal bud after it has started out and grown a few inches; therefore, heading-in has the effect of thinning the fruit since the buds are co-terminal, and by cutting off too many of the tips too much of the fruiting wood is often removed.

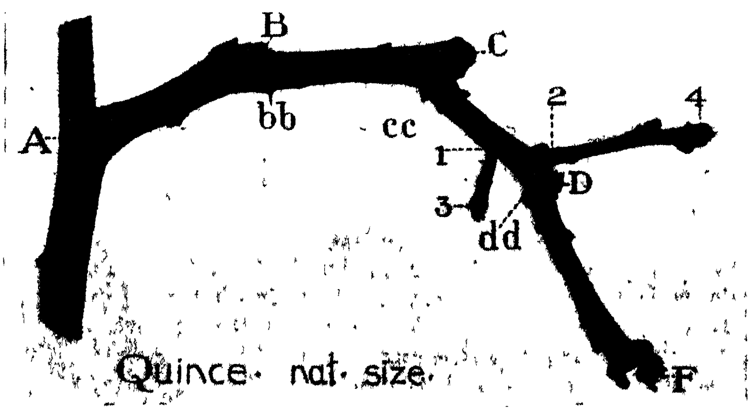


Fig. 154.

Fig. 154, on the opposite page, is an illustration of the twig of a quince tree which, on examination, it will be seen is four years old (*i.e.*, the twig). It first shot from point A, grew about an inch, and threw out a flower which set and carried a fruit, during which time it developed a bud at BB, which started out the following spring and bloomed at point C, where it set and carried a fruit. During this second summer it developed a bud at point CC, which extended to point D the following spring, bloomed and carried a fruit, also developed a bud at point *dd*, as also two auxiliary buds, 1 and 2, the latter two extending to points 3 and 4, and the former to F, where it bloomed and bore a fruit, again developing buds at the terminus as also at points 3 and 4.

Fig. 155

Fig. 155 shows a well-pruned four-year-old tree.

Bee-keeping and the Drought.

ALBERT GALE.

"How doth the little busy bee, &c." If the author of these oft-quoted words had lived in the Australian Commonwealth, especially in the State of New South Wales, he may have somewhat reflected as to the suitability of the "shining days" for gathering honey. In the years of grace, 1901 and 1902, there were shining days enough to satisfy picnickers, yet the honey-flow almost throughout the whole of this State has been comparatively nil. Of course there have been a few favoured spots, and the bee-keepers of these isolated places will reap a harvest. During this last decade, as it regards the honey-flow, matters have been going from bad to worse, and this year "worse" has dwindled down to almost vanishing point. Somewhere about fifteen years ago we heard of abnormal yields of honey. Bushmen passing through the forest during certain seasons of the year stated that the odour of honey assailed them on every side. Some years back the bush and forest were the happy hunting grounds for bees' nests. Wild bees, *i.e.*, domesticated bees that escaped and took to bush life, were abundant in all favourite honey-producing districts. I have known settlers take out a horse, cart, and cask, and return with a winter's supply of honey for several families. I have seen a settler fell a tree where there was a bees' nest, and when the tree was down find two nests where he had only expected to find one, and carry home therefrom two ordinary sized tubs full of honey and honeycomb. Such things now savour more of fairy tales than actual facts. When the natural conditions for profitable bee-keeping existed there were a few hives to be met with around the homes of most country people, and in the suburbs of towns. Amateurs who commenced bee-keeping when the good seasons began to decline became disgusted, and said there was nothing in bee-keeping. The practical and the professional bee-keepers blamed the multiplicity of people who went in for the hobby of bee-keeping as the cause of the decline of the honey industry.

It was not the number of persons who engaged in bee-keeping that caused the falling off in the honey crops that have had a downward tendency these succeeding years, but the decreasing rainfall and consequently an increasing drought. The honey season of 1901-2 almost reached a climax in some districts.

The increasingly droughty seasons are largely, if not wholly, responsible for the trouble amongst bee-keepers. As good seasons return they must bring prosperity with them. Of course, prosperity

to everyone; but I refer particularly to bee-keepers. Nevertheless, by the time of the arrival of spring hundreds of bee-keepers will have gone under never to rise again. It is said in Biblical language, "What the palmer worm left hath the locust eaten; and what the locust left hath the canker worm eaten." So in relation to our bee-keepers, what the drought left hath the bush fires devoured; what the bush fires have left spring dwindling will destroy; and what spring dwindling leaves the bee moth may consume.

Successive partial droughts have a tendency to numerically weaken colonies of bees, especially when these are kept by thoughtless men to take the last spoonful of honey that they may get present gain. It is the aforementioned kind of men who will feel where the shoe pinches. If bee-keepers did but think of the results of the skin-flint policy of too closely extracting from the brood chamber, many a weak colony would be strong to-day, and many a dead one would be alive. I have always advocated that *all* the honey in the brood chamber is the honest property of the little industrious workers, and that stored in the supers, and that only, the property of the bee-keeper. Those who have followed such a principle will now be reaping the benefit of their forethought. Where bees have been permitted to provide against famine there has been a sufficiency of stores to well carry them over this final season of drought.

One of the most ruinous results of the drought of 1901-2 to the bee-keepers, even where colonies have been successfully wintered, will be the physical and numerical weakness with which they will emerge from the winter's scarcity. Scarcity of winter food means a scarcity of spring brood. The queen will only lay, even in good summer seasons, in proportion to the strength of inmates both physically and numerically. The life of a bee is of short duration during the summer season. The greater the honey-flow the more work for the bee. As a rule bees do not die from senility, but from their laborious peregrinations. The wings of bees are very fragile, and their vibration is extremely rapid, consequently the wear and tear of these organs of locomotion is very great. When the wings become frayed it militates greatly against their locomotive powers. This in conjunction with the heavy loads they carry causes them to fall to the earth, and when they fall thus it is very seldom they rise again. During winter months their lives are prolonged because the conditions before narrated are absent, consequently bees hatched late in autumn survive till the following spring. This spring it may be found that the colonies that have pulled through the winter will be rapidly decimated and large numbers of them die out.

When a strong colony of bees go into their winter quarters with an abundance of stores, both of pollen and honey, the queen slacks off her laying proclivities, but does not wholly cease to lay, especially in the more genial districts of the State and also if the bees are well housed; but where there is an insufficiency of these conditions, and where the bees have to live from hand to mouth the laying of the queen decreases. If this spring should prove to be a backward one, hundreds of dead bees will be seen scattered around their homes;

these are the ones I have been referring to, the bees hatched late in the autumn, whose duties or use are more for keeping up the warmth of the hive and for field labour. In ordinary seasons the shrinkage caused by the deaths of these old bees is made up by the winter increase within the hive. If conditions do not supplement this natural shrinkage, *i.e.*, to use a statistician's phrase, if the births are not equal to the deaths, the results must be as I have stated, because there will not be a sufficient number of inmates to cover the developing brood.

"What has been is likely to be, and the more frequently it has occurred the more likely it is to recur"; and again, "What has been done must remain done." The drought of 1901–2, perhaps, has been the severest yet experienced. We know that since the beekeeping industry assumed such proportions as it has of late such disasters as we are now passing through have never before been faced, but it is logically certain that bee-keepers will again have to toe the line. The present fall of rain may point to the beginning of the end of the drought—we must bear in mind we are not yet out of the wood. We cannot recover the past. It is too late to "Lock the stable door when the horse is stolen." With all their care and forethought the human family in some countries suffer more or less from famine, but with a universal system of storage the evils of famine can be largely counteracted, to wit, the seven years of plenty succeeded by the seven years of famine of Joseph's days. It is in these years of plenty that the bee-keepers' should prepare for such seasons of drought as we have lately passed through. "In the time of peace prepare for war" is a motto that holds good otherwise than in political strife. "For want of thought there is danger wrought" even amongst our bees. One great source of the decimation among bees, both with the amateur and practical bee-keepers, that is, among the avariciously practical ones, is more or less apparent every spring. It is seen in the small colonies that have dwindled away and the hives, when overhauled, that are full of empty combs, which is chiefly the result of starvation caused by extracting the honey stores from the brood chamber, bees that dwindle through the cause named are backward in swarming and the weaker they are the later they swarm.

In the coming spring a lot of the troubles I have named will be apparent. Care will have to be exercised that bee diseases and bee enemies have not made an attack on the weakened colonies. Poverty is always a breeding-ground for enemies and diseases in animals other than bees. It will be as well as soon as the spring honey flow commences to unite all weak colonies and make one good strong one. One strong colony gives more honey than half a dozen weak, and throws off far better swarms. Indeed, it is frequently the case that small colonies fail to swarm. In the future never take honey from the brood chamber. There is no loss to the owner in keeping it there, but it is a decided gain to the bees. "Small profits and quick returns," is an excellent mercantile motto that could be well altered into "Strong colonies and quick returns" for the benefit of bee-keepers.

Notes on Fruit Production.

W. MARSHALL MOORE.

My business taking me to all the orchard country, and having been a planter on an extensive scale, a few practical notes from me may be acceptable.

On page 678, June number of the *Agricultural Gazette*, Mr. W. J. Allen gives some good practical orchard notes; such and much other educational work that is being done by the Agricultural Department must be of great value to the State. What I comprehend is that it is not sufficiently known, or, at least, not practically availed of to that extent that it should be by producers. If these people will not come to the lessons, the question is how to get the lessons to them—not so much for individual gain as for the good and advancement of the State as a producing country.

In fruit production, which comes more particularly under my notice, comparatively few of the growers of any extent seem to profit by the lessons taught at the Hawkesbury Agricultural College. In all the orchards I have visited I have not seen a single copy of the *Agricultural Gazette*, which growers can obtain upon application.

When I have referred to the magnificent samples of peaches, nectarines, plums, apricots, grapes, &c., produced at the Hawkesbury College last season, and that the same sold in the Sydney markets at top prices, I was told by numbers of growers that it would not pay them to expend all the money that it cost the College in fertilisers, labour, water, &c., to produce those fruits, and, further, they said that the State should not enter into competition with the individual by spending State money in producing better fruit than the fruit-grower could produce.

Of course, such narrow-minded views are erroneous, still they exist to a very large extent, and are the result of long-continued favours by nature smiling upon the most primitive efforts and the minimum of labour and skill in the production of fruit generally. The more enlightened growers can see that the lessons taught by the College go to show that, under the most adverse conditions as to soil and rainfall (the College possessing the poorest soil and this season no rainfall), the money spent in producing the best fruits which bring the highest prices is the cheapest in the end, and worth all the cost to the State in showing fruit-growers how to do it.

At the present moment (middle of July) the Hawkesbury Agricultural College has a magnificent lot of oranges and other citrus fruits ready for the market, and in perfect condition, while all the country round Richmond, Kurrajong, Hawkesbury and Central Cumberland, and, in fact, pretty well everywhere (except Kurrajong Heights and a few other very favoured spots), the oranges are not much bigger than pigeons' eggs, on account of the long drought, which threatens to spoil

the crops not only for this year but also for the next year. Surely if the College can show how to grow good oranges in drought times, and plenty of them, the knowledge should be imparted to all citrus fruit-growers, and the information taken to them if they will not come for it. This would be my method of dealing with the diseases of fruits: Instead of a Pests Bill, go to every grower and say to him, "I have brought you this mixture, or this appliance, and I will assist you and show you how to use it at the minimum cost."

In the parts I have recently visited there are thousands of cases of oranges, almost as big a crop as last year (our firm alone put through 20,000 cases last season); but, on account of the drought, the oranges this year are from the size of marbles up to the size of hen eggs, the largest hardly 2 inches in diameter, and worth hardly anything as a marketable commodity. If with rain, and the oranges allowed to hang for a couple of months, the size would be increased to 2¼ inches and 2½ inches, they would be then of good marketable value at high prices, which would mean thousands of pounds to the fruit-growers. I was asked everywhere whether the rain would split and spoil these oranges. It is a question which involves thousands of pounds in the aggregate, and yet no one does anything. I went to the Principal of the Hawkesbury Agricultural College a few days ago and asked him, and he immediately said he would have the test made at once.

Concerning this matter, Mr. Potts reports that for at least six weeks from the date upon which Mr. Moore asked him to have the experiment undertaken not a drop of rain fell on the College orchard, so the point in question could not be decided. In all probability, however, rain would scarcely have improved the condition of the fruit to any appreciable degree from a commercial point of view after a prolonged perish. The best thing that orchardists can do in a case of this kind is to profit by the experience of the drought, and take precautions to prevent the complete drying out of their soil. It is too late in the season now to do much in the way of green cropping; the best method of conserving the moisture now in the orchards, as the result of recent rains, is to keep the cultivator going at frequent intervals up to the beginning of autumn. A horse-hoe that will keep the soil thoroughly well stirred to a depth of several inches, and that can be drawn by one horse comfortably over about 3 acres a day, can be procured for about £2 10s. If that is out of the question, an ordinary harrow will serve in a sort of a way to keep the soil in a fine state of division during the hot, dry season, and prevent evaporation of soil-moisture. Next March, when the cultivator is going over the orchard for the last run of the season, pop in a seeding of vetches, tares, rye, rape, clover, oats, or barley, and turn it under in the winter ploughing, which should take place before the green crop runs to seed. An orchard so treated will resist drought, and the production of "marbles" will cease. At the Departmental orchards at Hawkesbury Agricultural College, Wagga, and Bathurst, there are no facilities whatever for irrigation.—ED. *A. G.*

and EXPERIMENTAL FARM.

THE SMALL YORKSHIRE PIG AT HAWKESBURY AGRICULTURAL COLLEGE.

H W POTTS

AN interesting problem in all young countries is the introduction of pure-bred stock and their facility for adaptation to climate and environment.

It is a matter of concern to the enterprising studmaster as well as the stock-owner to determine satisfactorily the effects of climate on imported stock, and often doubts are raised and expressed, but so far, happily, not realised in most cases. The experience, so far, goes to prove that acclimatisation under such genial conditions tends to destroy desirable points.

The compilation of statistics to verify this contention presents some difficulty, but if owners of pure stock would regularly record the results of their experience and practical observations, I venture to think that it would be shown that the progeny from imported stock, whether thoroughbred, cow, or pig, would show distinct evidence of improvement in type and economy in maintenance.

Some experience has been acquired at this College, mainly with imported pigs. The influence or determination of characters in this instance being of a profitable nature, and where acclimatisation has undoubtedly materially affected in the right direction the utility of the small Yorkshire breed.

It may be credited to the characteristic shrewdness of the original designers of this type that it has emerged from a variety that endeavoured to lay claim to popularity many years ago in this class; and most probably we are indebted to an introduction of Chinese strains commingled with indigenous blood to found the present fixed breed. Throughout the gradual building up of this class we find a continuous effort to develop symmetry and compactness of form, with the highest adaptation for intensive conditions in which early and rapid maturity for high-grade palatable pork are distinctly prominent features. No breed, so far, has shown such marked capacity for maturing quickly at so early an age.

The short limbs, model form, and docile disposition in the full power of early growth are constantly present to the observer, as well

as its capacity to assimilate a maximum of food constituents which go to make flesh, than in older or other classes of pigs. Moreover, it is shown that their vigorous digestive power is credited with producing a pound of pork at the lowest cost in comparison with other breeds. The proportion of bone is small, offal light, and the pork of suitable grain, fine texture, delicate and palatable in flavour, and of such a character as to always meet a ready sale. The flesh possesses that substance and quality so fully recognised by the consumer. Butchers realise the superiority of the breed as porkers, and do not hesitate to cater for their customers' demands. The easy even temper and tractable disposition of the small Yorkshire breed is almost phenomenal, and will account in some measure for its early maturity. Quality supersedes size. The clear healthy skin, curly, fine hair, and cleanly habits of the animal add qualifications which are not always so prominent in other breeds. They become pets in a farm yard, and repay fully for the delicate attention paid to them. As porkers, no breed, so far, can compare with the small Yorkshire. All the good commercial qualities claimed for them in their native home have been brought prominently out in the type as bred in Australia, and a reference to records shows that they have been more intensely accentuated through acclimitisation.

No. 1 shows a young boar, aged under 12 months, and bred at the College from imported stock; born 1st September, 1901; by "Coleshill Prince" (imp.); dam, "Coleshill Lucy" (imp.); both bred by Hon. D. P. Bouverie.

The head is small with short nose and a well dished face, width between ears very great, and ears small, thin, erect, and pricked. In the body the top line is straight and the belly line level, with great depth and width in loin and flank; the hams show breadth and thickness; the legs are very short and straight. He has a smooth flexible fine skin, covered by a fine, thick, curly hair. At the time the photograph was taken he was not quite 12 months old. His measurements were:—Girth, 54 in.; length, 49 in.; jowl, 36 in.; height, 26 in.; weight, 273 lb.

The sow (Nos. 2, 3, and 4) was bred at the College, on 8th September, 1901.

Sire, "Coleshill Chief" (imp.)—sire, "Coleshill Dick" (4505); dam, "Coleshill Lady" (5446); bred by the Hon. D. P. Bouverie.

Dam, "Anemone"—sire, "Alexander"; dam, "White Queen"; bred by Mr. C. Betts, Gladesville Hospital for Insane.

At the time the photograph was taken, 21st August, her measurements were:—Girth, 53½ in.; length, 49 in.; jowl, 38 in.; height, 22½ in.; weight, 268 lb.

Hawkesbury District Farm Notes—October.

H. W. POTTS

The outlook is not quite promising, with only 2½ inches of rainfall for last month. That was followed by winds and a decided increase in temperature.

SMALL YORKSHIRE PIGS AT HAWKESBURY AGRICULTURAL COLLEGE PIGGERY.

Maize.

Owing to the immense food value of maize, and the wide variety of conditions under which it will grow and mature, the utmost attention may be devoted this month to sowing. The danger of frost is now remote, and it is generally recognised that the maximum of activity may be displayed in getting in this splendid forage and grain yielder. There are numberless varieties recommended, and although the experienced farmers will very properly stick to the tried sorts, yet it is a wise and progressive plan to introduce one or more reputable varieties in sufficient quantity to constitute a practical test. Qualities are often claimed for these in good faith. Be they ever so fair and promising, there is always the proviso that local conditions may prove adverse to their full development. The quantity of maize grown this year doubtless will be controlled by the rainfall we anticipate. As a staple grain product a good market will be available. With the advance made in late years in raising stock and dairy products, an increasing demand is felt for the crop as green forage and for conservation in the form of ensilage. The late winter's experience, to those who were fortunate to provide a stock of maize ensilage, certainly gave ample proof of the stern necessity for renewing the crops for this class of fodder, and increasing them largely. Apart from the absolute food value of maize as a grain or fodder, the gain to the soil by ploughing in the roots of the crop is often overlooked, and not fully recognised in our warm climate. It is an important factor in aiding the soil to retain moisture, it increases the humus, and improves the texture, when utilised as a summer fallow. As a catch crop we also realise the usefulness of maize. Wherever the land needs cleaning, few crops excel it for that purpose. There will be no difficulty this season in obtaining a deep, finely pulverised, clean seed bed.

The early planted maize, now above ground, should be cultivated thoroughly and often to destroy weeds and conserve moisture. With our limited rainfall so far this is essential to stimulate the growth of the crop.

Seed Maize.

It is expensive to purchase seed maize, as most farmers will fully realise this season, and again complaints are made of the character of that on the market in relation to its purity. It only accentuates the need for a greater provision being made to raise sufficient for future use. The advice, frequently given, may again be repeated this season—*i.e.*, to take special precautions to avoid cross-fertilisation where a number of varieties have to be raised—to sow and cultivate a separate area, far removed from the general crops. When the crop is ripening, pass along the rows, and cull out any of the plants that are indistinct and are not true to type, and also those that are deficient in growth and sturdiness. After harvesting, cull out all the cobs that are not well formed, or appear to have been crossed. When the corn is shelled, sift out the small grains, retaining only the sound plump seed for sowing. Strict attention to this will result in improved yield as well as quality.

Sorghum.

The ground is warm and suitable for receiving the main crop this month, and sowing should be made on a well-worked soil, with fine tilth. The best results are obtained when the crop is sown in drills 3 feet apart, and afterwards cultivated. It should be remembered, in view of the low rainfall this season so far, that sorghum endures drought much better than corn, and is constantly grown during dry seasons, when maize would prove a failure. It feeds very deeply, and hence draws its moisture in soil and country in which maize cannot be raised. Moreover, it leaves the soil in better condition for corn and other surface-feeding crops. Mature sorghum provides an excellent fodder for cattle.

Millets.

These should be sown this month, also by ordinary maize drills. The Broom Millet is a crop for which there is a good demand, by the broom-makers, and the variety mostly favoured by them is the White Italian. The method of cultivation is similar to that of maize or sorghum.

Cow-pea and Soy Bean.

These useful legumes are best sown in October. One prominent writer states:—"The cow-pea (*Dolichos Chinensis*) is proving an unmingled blessing to the agriculturists of the United States. It is now being grown for table use, for forage, for soiling food, and for winter grow fodder; but its greatest value, probably, lies in its power, first, to in worn out and poor soils, and second, in its power to renovate them."

The series of experiments conducted at this farm fully confirm the good opinion held by our confreres across the Pacific, not only as a food, but as a manure or fertiliser. We have in this plant another adjunct in fodders to provide against a dry season, and the returns shown under extreme conditions of drought, and on poor soil, at the College proves it to be a crop that should receive the earnest attention of all farmers interested in feeding stock. Cow-peas will grow better on rich soil than poor; but its prominent feature is its ability to produce prolific crops on the latter. It is a deep and gross feeder. The best fertiliser is superphosphate. Cow-pea may be utilised as hay, and, further, it forms a valuable addition to maize for the silo, as also does the soy bean.

Sweet Potatoes.

The plants in the nursery-bed should be now ready for setting out. They will produce a more vigorous growth if planted during showery weather, and it will be further stimulated by soaking the plants in a mixture of cowdung and water before setting out.

Pumpkins and Squashes.

Planting these can be completed. They will be in great request this season to provide a succulent and palatable fodder for dairy cattle and pigs when green feed becomes scarce.

Water and Preserving Melons.

These should also be planted for feeding purposes. They can be utilised in a variety of ways for winter feeding. The jam-makers favour the Japanese Snow preserving melon, in consequence of the facility with which it can be peeled and the seeds removed.

BATHURST FARM NOTES.—October.

R. W. PEACOCK.

Maize

Should be sown largely for grain, ensilage, and green fodder.

Sorghums and Millets.

Planters' Friend, Early Amber Cane, and Sorghum Saccharatum can be sown for green fodder and ensilage upon land suitable for growing a crop of maize. They do not thrive upon the poor, light soils of the district, are heavy feeders, and the land should be in good heart and of good tilth. They should be sown in drills about 2 ft. 6 in. or 3 feet apart, and afterwards cultivated as for maize. Of the millets Hungarian is suitable for hay-making, its smaller stem curing more readily in the field than the coarser varieties. If cut just at it comes into ear it makes a very acceptable hay. It can be sown broadcast, or preferably in drills. Brown millet also thrives well in the district if sown upon land suitable for maize; it requires good cultivation.

Cow-peas

Should be sown for green fodder, ensilage, and green manuring. They withstand a lot of dry weather, and yield heavily on good soil. The black, white, and clay-coloured are suitable varieties.

Potatoes.

The planting of these for the early crop should be expedited, and the land already planted should be harrowed before they appear above ground, which kills most of the young weeds and conserves the moisture. Early Rose, Brownell's Beauty, Beauty of Hebron, and Bliss' Triumph are suitable varieties for the early crop.

Mangolds

Should be planted to provide winter food for cattle, sheep, and pigs. They require a rich, friable, deeply-worked soil and clean cultivation. They yield heavily, and should be pitted for winter use.

Field Carrots

Require similar soil and attention as mangolds, and make excellent food for horses and other stock.

Jerusalem Artichokes

Should be planted as they suit the climate, yield heavily, and make excellent food for pigs.

Pumpkins.

These make excellent food for milking cows. The mammoth varieties yield heavily, and they possess the advantage of being easily stored for the winter when such foods are valuable. The land should be well worked and kept free from weeds, and if the soil is mulched with well-rotted manure around the hills, large crops can be obtained upon the lighter soils as well as upon the rich alluvial lands.

The Sheltering of Dairy Cattle.

M. A. O'CALLAGHAN.

Rugs *v.* Housing.

At the beginning of winter I caused an experiment to be carried out at Berry Stud Farm, whereby the effects of rugging and housing milch cows were compared with the common practice of allowing the cattle to remain without any shelter beyond what might naturally exist in the paddocks. The following were the conditions:—

Two cows, a Shorthorn and a Dexter-Kerry, were allowed to remain out of doors day and night during eight weeks, commencing on 15th June, and their yields were taken as a basis of comparison. During the first six weeks these two cows were not rugged, but during the fourth period they were rugged at night.

During the periods Nos. 1, 2, and 3 the cows were given 20 lb. oaten chaff and 1 lb. of bran per day, in addition to what grass they could pick up; and during period 4 the chaff was increased to 30 lb. per head per day.

Table of comparative results.

Cows.	Basis for calculation.	Comparative Milk Yields for each Period, compared with No. 1, or Basis		
	Period 1	Period 2	Period 3	* Period 4
1 and 2	Out and unrugged, 100.	Out and unrugged, 93 6.	Out and unrugged, 82 0	Out and rugged, 81 2.
3 and 4	Out and unrugged, 100	Stabled, 100.	Out and rugged, 88 9.	Out and rugged, 93·3.
5 and 6	Out and unrugged, 100.	Out and rugged, 94·1.	Stabled, 88·5.	Out and rugged, 96·0.

* Extra food was given in Period 4.

The weather during the first period and the first half of the second period was dry, cold, and frosty. During the latter part of the second period, wet, cold weather was experienced. The weather during the third and fourth periods was similar to that of the first.

Taking the cows in groups of two, and working on the averages, it is seen that the two cows which were out and *unrugged* for periods 1, 2, and 3 showed a shrinkage of 6·4 per cent. between the first and second periods, and a shrinkage of 12·4 per cent. between the second and third periods. The shrinkage between the first and third period

was 18 per cent., while the shrinkage between the first and third periods in the case of the two groups which were sheltered by rugging and housing alternately was but 11·1 per cent. and 11·5 per cent. Then, taking the fourth, where all cows were under similar treatment (being out day and night and rugged), it is seen the shrinkage in the case of cows 1 and 2 was merely nominal when compared with the previous period. Thus the tide in the shrinkage was practically stopped ; but how much was due to the rugging, and how much to the extra feed, it is not possible to estimate accurately.

Taking the results obtained from the other two groups, it will be seen from table that the two cows which were stabled in No. 2 period maintained the same yield as in period No. 1 ; but that during period No. 3, when these cows were turned out at night and rugged, a loss of 11·1 per cent. took place, and in period 4 a gain occurred under the same rugging conditions, but with an increased supply of chaff.

Cows 5 and 6 seem to have done better when rugged than when stabled. The shrinkage between the periods 1 and 2 was the same as between 2 and 3; thus the cows fell off at the rate of nearly 6 per cent. in each period. The shrinkage was mainly due to the Kerry cow, No. 6, an animal that does not seem to appreciate stabling, because during period 4, when she was again put out and rugged, she increased very considerably, and much more than is attributable to the increased food supply. The gain in her case was 19 per cent. when the fourth period was compared with the third.

Looking at the results, it is evident that there is a considerable advantage in rugging or stabling when compared with ordinary out-of-door conditions of shelter. The comparison of results between stabling and rugging are not so conclusive. Cows 3 and 4 did better when stabled than when rugged, and showed less shrinkage for period 2 than cows 4 and 5, which at that time were out but rugged. It should, however, be borne in mind that during the second week of period 2 the weather was wet and cold, and hence stabling should be a distinct advantage. On the other hand, these results would go to show that when the weather is dry, though fairly cold, cows will do nearly as well when well rugged and turned out as when stabled at night. The cows will, however, consume more food because, though they may not get very much grass in a dry season at night, in winter, they will get some, and will probably consume more grass in the twenty-four hours than the cows which are stabled by night, and out on grass by day.

If each week be taken separately, and the third and second weeks be compared some interesting figures are obtained. It will be noticed that all six cows were out day and night during the first fortnight, and that at the end of that time four of the cows were sheltered (two being rugged, and two being stabled at night). The two cows that were stabled at night responded to the better treatment at once, and showed a gain of 7 per cent. for the week, while the two cows that were rugged also showed a distinct gain, the increase being 3 per cent. The following week cold rain set in, and all cows fell off in yield of milk and butter-fat.

The following particulars of the individual cows will be of interest :—

No. 1 is a roan shorthorn cow on her first calf. She had been calved nine weeks when the test commenced.

No. 2 is an imported Dexter-Kerry cow, and a heavy milker. She had been calved six weeks on 16th June.

No. 3 is an imported Jersey cow, and a good milker. She had been calved nine weeks when test commenced.

No. 4 is an Ayrshire on her first calf, and had been calved nine weeks on 16th June.

No. 5 is an imported Ayrshire, and had been calved thirteen weeks on 16th June.

No. 6 is an imported Kerry cow, and a heavy milker. She had been in milk seven months when the test began.

The following were the averages of fat per cent. yielded by the cows during the fourth week which was wet, and the fifth week which was mostly fine.

Cows			Wet week.		Conditions.	Dry week.
1 (Shorthorn)	O	...	3·3 per cent.	...	O	3·4 per cent.
2 (Dexter)	O	...	4·3		O	4·5
3 (Ayrshire)	S	...	4·2		R	4·5
4 (Jersey)	S	...	4·3		R	4·6
5 (Ayrshire)	R	...	4·5		S	4·4
6 (Kerry)	R	...	5·0		S	5·2

* O means out and unprotected; S means stabled, and R means rugged.

It is thus seen that no matter what the conditions were during the nights every cow, save one, showed a higher fat percentage during the dry weather than during the wet.

These results should encourage farmers to protect their milch cows from the wintry blasts.

The cows that were rugged and housed kept in very much better condition than those which were unsheltered.

Facilities for obtaining the weights of the animals were not available.

Sheltering Cattle in Mild Climates.

A similar experiment to this was carried out at Wollongbar State Farm, but as might be expected, the advantages of housing or rugging in this semi-tropical region were not very evident. Of the cows that fed well through the experiment there appeared a slight advantage in stabling, but nothing commensurate with the extra expense. The temperature was seldom below 46° F. at night at Wollongbar, the maximum for the day being about an average of 64° F. At Berry, however, the temperature at night would frequently be 20 degrees F. lower than at Wollongbar.

Hand-feeding Sheep.

F. B. GUTHRIE.

SINCE my paper on the above subject appeared in August issue some very interesting results have been communicated to me by one of the leading pastoral firms. These results are of special value because the information supplied has been tabulated with some care, and forms a clear and reliable statement of a practical feeding experiment extending over some months.

The manager of their station states :—

"In April I began feeding 2,000 maiden ewes on chaff, bran, and a little wheat, with a little scrub in addition—myall, whitewood, and wilga—chiefly wilga. They were in lamb to specially-selected rams, and I valued the lambs very highly. The lambing was a success, and I marked about 64 per cent.

"Ten days after the completion of the lambing, I took off all the ewe lambs, which I have since been feeding on the ration shown in Table 3.

"Since the 1st June, I have been feeding a few ewes, a few rams, and the ewe lambs on regular rations, measured out daily, as shown in the accompanying tables.

"The sheep rationed as per Tables Nos. 1 and 2, were in very poor condition when brought in; they were shorn at once, and penned up at the shed, water being given to them in their pens. On the ration they have fattened, and are now in splendid condition. I could very well reduce the ration to the rams, as they are really fat.

"The lambs have done exceptionally well, and are now quite fit to be turned out directly there is a shoot of grass. For the lambs the wheat has been soaked with a little treacle, and the turnips were boiled, but now the lambs are eating raw turnips freely after they have been broken on the ground for them. I have not been able to add any green feed to the ration. The only thing not shown is a little salt given about three times a week, making no appreciable difference to the cost.

"The conclusion to which I have come as a result of my experiments is that strong, healthy lambs three weeks old or over can be successfully reared on artificial feed at a cost of twopence per head per week at the present price of feed."

"MEMORANDUM re Artificial Sheep Feeding, showing Average Daily Ration, amount of Feed used, Total Cost, and Cost Per Head Per Week.

No. of Days.	No. of Sheep.	Description of Fodder.	Average Daily Ration.	Total Feed.	Cost per Bag or Bushel.	Total Cost.	Average Cost per Head per Week.
		(1.)					
			oz.	cwt. qr. lb.	£ s. d.	£ s. d.	
30 days.	54 ewes.	Chaff	4	3 2 0	0 6 0	1 0 0	4d. per head per week.
		Wheat	$2\frac{1}{2}$	2 1 18	0 5 0	1 1 3	
		Bran and Pollard .	3	2 2 10	0 1 6	1 1 9	
		Turnips	$3\frac{1}{4}$	3 2 0	0 4 6	0 13 6	
			$12\frac{3}{4}$	11 2 0		3 16 3	
		(2.)					
			oz.	cwt. qr. lb.	£ s. d.	£ s. d.	
39 days. June 1 to July 9.	34 rams.	Chaff	$8\frac{1}{2}$	6 1 0	0 6 0	1 17 6	1s. per head per week.
		Wheat ..	$7\frac{3}{4}$	5 3 1	0 5 0	2 16 3	
		Bran and Pollard .	9	6 2 12	0 1 6	2 15 6	
		Turnips ..	$12\frac{1}{2}$	9 1 0	0 4 6	2 1 6	
			$25\frac{3}{4}$	27 3 13		9 10 9	
		(3.)					
			oz.	cwt. qr. lb.	£ s. d.	£ s. d.	
28 days. June 12 to July 9.	430 lambs.	Chaff	2	13 0 0	0 6 0	2 8 0	2d. per head. per week.
		Wheat . .	$1\frac{1}{2}$	10 1 22	0 5 0	4 17 6	
		Bran and Pollard .	$1\frac{1}{4}$	7 2 0	0 1 6	3 8 0	
		Turnips	2	13 3 0	0 4 6	3 1 9	
			$6\frac{3}{4}$	44 2 22		13 15 3	

REMARKS.

(1.) These ewes, shorn June 1, were low in condition, and improved very much on this ration.
(2.) These rams, shorn May 31, poor in condition, fattened on this ration.
(3.) Lambs ranging from 3 to 8 weeks old are fed on this ration, and do well."

Calculated out on the basis of the composition of the foods employed, these rations pan out as follows:—

TABLE showing the composition of the above ration.

		Total dry matter.	Albumenoids.	Carbohydrates	Fat or oil.	Total nutrient matter.	Albumenoid ratio.
1. 4 oz. chaff ... ... $2\frac{1}{2}$ oz. wheat ... 3 oz. bran & pollard $3\frac{1}{4}$ oz. turnips ...	for ewes	·553	·061	·342	·015	·418	1 : $6\frac{1}{4}$
2. $8\frac{1}{2}$ oz chaff . . $7\frac{3}{4}$ oz. wheat . 9 oz. bran & pollard $12\frac{1}{2}$ oz. turnips ..	for rams	1·472	·174	·918	·043	1·133	1 : $5\frac{3}{4}$
3. 2 oz. chaff ... ... $1\frac{1}{2}$ oz. wheat . . $1\frac{1}{4}$ oz. bran & pollard 2 oz. turnips	for lambs	·278	·030	·175	·006	·211	1 : $6\frac{1}{4}$

The calculations assume that the chaff is wheaten chaff, and that the bran and pollard are given in equal proportions. The amount of molasses given to the lambs has been neglected in the calculation. It was presumably diluted before being sprinkled, and is not likely to have exceeded in amount the quantity of wheat. The amount of diluted molasses would not materially affect the figures. In this case I think it is clear that some pickings were available, scanty ones no doubt, but sufficient to eke out the scanty ration. Of the three rations given it will be seen that the second one is, from our point of view, a good ration, and with a little extra pickings should be quite suitable for fattening sheep. Ration No. 3, for lambs, is certainly a revelation, and No. 2 is very much lower than what has been hitherto regarded as constituting a maintenance for mature sheep, being about one-third of the quantities given in the dietary table already quoted.

In a letter which reached the Department just too late for insertion in the last issue of the *Gazette*, a pastoralist in the Northern District says:—"I have unfortunately been compelled to hand-feed all my ewes for some time, and have tried various rations. The feeding of maize broadcast has, in my case, proved a failure, as at the end of a fortnight the sheep commenced to die, and on examination I found the stomach contained a quantity of undigested corn, which had caused inflammation, completely destroying the coating of the stomach. I was giving a ration of 3 oz. maize per day, and there was a little dry feed left in the paddock; also apple-tree and other edible scrub.

"These sheep are 3 years old, and due to lamb from the 7th September.

"The remainder of my lambing ewes I am feeding on chaff and corn-meal, the corn and cobs being ground together. The ration consists of 9 oz. of chaff (hay) and 6 oz. corn-meal per head per day. I commenced feeding in July, when the ewes were in good condition, and they have since improved, although there is little or no feed or scrub in the paddock. The two and four-tooth ewes I am giving ½ lb. hay chaff and 2 oz. corn-meal per day, and they have held their condition well.

"From my short experience, I cannot speak too highly of the value of corn-meal; the cob (or core) appears to contain all the properties of bran, keeping the sheep in good health." (*Vide* note p. 1065.)

Hand-feeding Stock in the Moree District.

By E. R. SCOTT,
Inspector of Stock, Moree.

Mr. Guthrie's pamphlet on hand-feeding stock has been received with a good deal of interest in this district, where hand-feeding has been largely resorted to during the present drought.

The following notes, made from personal observation during my tours in the district, may prove of interest. I have distinguished the

various places by numbers, to avoid giving too much publicity, as some owners do not wish their names mentioned, for various reasons.

No. 1 Station.—10,000 ewes and lambs were fed on an allowance of 1¼ lb. lucerne hay per head per day for between two and three months. This gave good results, and about 15 per cent. lambs were saved. On same station 10,000 weaners were fed on barley straw and molasses, the latter at a strength of 1 to 14. The method adopted was to soak the bales with the molasses overnight, spreading out the straw next day. The results were not satisfactory; the sheep lost condition, and were beginning to die. The feed was then changed to 1¼ lb. good wheaten and oaten chaff, with plenty of grain in it, and they have been about four months on this ration with occasionally a little lucerne hay or mangels for a change; when this was given, the allowance of chaff was reduced proportionately. The sheep improved soon after the change from molasses and barley straw to chaff was made, and have since done fairly well, with very little loss.

Had there been sufficient scrub on this property, hand-feeding would not have been resorted to.

The manager considers lucerne hay the most satisfactory feed, but, owing to the high prices and scarcity, it has simply been a matter of using whatever feed was procurable.

On No. 2 station 6,000 ewes were fed on a ration of ½ lb. wheat per day, given night and morning in equal feeds of ¼ lb. per head. At time of visit the sheep had been fed for three months with satisfactory results. The wheat was soaked for twenty-four hours, and given in galvanised iron troughing; the ordinary half-round guttering was used. The sheep had no other feed, but were looking well and evidently doing well on their allowance. No loss to speak of was experienced after feeding was resorted to.

On No. 3 station 12,000 sheep were being fed on scrub and maize, ¼ lb. maize per day being the allowance; the results were satisfactory.

Another lot of 2,000 breeding ewes were being fed on ½ lb. oaten hay and 3 oz. maize per head. The method adopted was to scatter the corn broadcast on the ground over 3 or 4 acres, keeping the sheep back until the feed was all spread. The sheep were then allowed to come quietly on to it, and by this means all got an equal share. Of this lot of 2,000 ewes, previous to being fed 100 were lost in a week. After being fed for a week, the loss was one only, thus showing the value of the feeding.

On No. 4 property the stud sheep had been fed for several months on an allowance of ½ lb. of maize spread broadcast, varied with a little lucerne hay and mangels when procurable; these sheep were pulled through without loss, and a good many of the lambs saved.

Re Prickly-pear Feeding.

I have lately visited a number of holdings in the district where prickly-pear feeding for cattle was resorted to.

On No. 1, 400 head of cattle had been fed on prickly-pear for four months with a loss of 1 per cent. per week. The owner was satisfied with the results, as the cattle were very poor when he began to feed.

He estimated the cost of feeding at 6d. to 7d. per head per week. Seven (7) men were employed in preparing the feed. The method adopted was boiling and steaming to destroy the thorns, and, after cooking, cutting the pear up into moderate-sized pieces. I consider the method of steaming the pear much the best, as it is drier and easier to handle, and no slop as when boiled. An ordinary 400-gallon tank with the head cut out was used. The portion cut out was punched with holes and let down into the tank, on blocks about a foot from the bottom. The water was then put in, and under the false bottom, and the tank filled with pear and covered over. In about an hour it was fit for use; that is, the thorns were destroyed.

On No. 2 holding, 200 head of cattle had been fed for three months, with a loss of ten head only. The owner was quite satisfied with this result, as the ones which died were very low when feeding was begun.

No. 3 had been feeding fifty head for three months, with a loss of one only, and this partly by accident. In this case the cattle had a little scrub as well.

No. 4.—Twenty-one head were fed for three months, with a loss of one only.

At several other places visited, pear was being fed with much the same results. At three places visited, the pear had been tried and given up, the owners stating that they found the cattle did much better on scrub alone.

In all cases where the pear was successfully fed, there was no available scrub on the holdings. The conclusion I have arrived at is that prickly-pear will sustain life when prepared as described, if given in sufficient quantities, but will not put on flesh or condition. In all cases the cattle I inspected were very low in condition, and only apparently eking out an existence.

For any person to state that prickly-pear will *fatten* cattle is *most absurd*. It is well known that cattle *will die* on prickly-pear if they begin eating it when grass is abundant.

I have known instances where cattle did well where scrub and prickly-pear was abundant, but it was the scrub, and not the prickly-pear, which was the factor in such cases.

It was noted on one holding that when a weak sheep got down, the others would immediately gather around, and begin eating the trefoil seed which was adhering to the fallen one's wool. This was observed in many instances, and the living ones were pulling their own wool out from the same cause.

IRRIGATION FOR PASTORAL PURPOSES.

IN a communication to the Hon. the Minister for Mines and Agriculture (forwarded through Mr. J. B. Reymond, M.L.A.), Mr. N. A. Gatenby, of Forbes, states: "At the Forbes Show concert I made the statement that for some months, until the river failed, I had fed 15,000 sheep off 200 acres of irrigated lucerne.

"The plan adopted was this: Some 6 or 7 acres of lucerne was mowed each day, and carted out to the sheep, which were in lots of about 1,000 each. Within a day or so of cutting the lucerne was watered, and by the time the 200 acres was cut, the first patch mowed was ready to cut again. Had the river not failed, I could have continued this practice right through the summer.

"I may mention that in 1898—another year of extreme drought—the river did not fail, and I irrigated from September to May. I cut the lucerne twice for ensilage, twice for hay, and three times for feeding sheep in the manner above described. The cuttings could have been continued, but rain fell, and I stopped cutting for the season in May. In the winter the lucerne will not grow much.

"In that year I fed 8,000 sheep during February, March, and April, off 120 acres cut as above. I had also 2,000 sheep grazing on other irrigated paddocks that I did not cut.

"No one knows the value of irrigation in our district better than Mr. Reymond, and I am sure that both he and I look forward to the time when great head works will be commenced with a view to giving us a more certain water supply."

Sugar-Cane as a Fodder for Stock.

Stockowners in the Western District, acting on the advice of the Hon. the Minister for Mines and Agriculture, are securing consignments of sugar-cane from the north coast as feed for their stock. The cane is landed in Sydney at about £2 per ton and is carried inland at the reduced rate of 10s. per truck. The stock greatly relish the cane, and stockowners who are feeding it without cutting or chaffing the cane in any way find that cattle are doing extremely well. It would, however, be more economical to cut the cane into lengths of a foot or shorter.

As to the feeding value of sugar-cane, the Chemist, Mr. F. B. Guthrie, furnishes the following analysis:—

	Whole sugar-cane.	Tops.	Mixture of half cane and half tops.
Water	71·0	75·2	73·1
Fibre	9·5	7·4	8·5
Ash	0·5	1·5	1·0
Albumenoids	0·6	1·7	1·1
Carbohydrates (sugar) ...	18·0	13·6	15·8
Oil and colouring matter ...	0·4	0·6	0·5
	100·0	100·0	100·0
Nutrient value	19½	16½	18
Albumenoid ratio	1 to 30	1 to 9	1 to 15

Mr. Guthrie adds: "Sugar-cane by itself contains so small a proportion of albumenoids to sugar that it requires the addition of some more nitrogenous food. Cane-tops is a fairly well balanced food, and its admixture to cane raises the feeding value of the latter. Where the cane only is available the addition of hay, bran, or pollard will help to balance the ration."

The "Panicum monostachyum" as a Forage Plant.

By J. DIEBDERICHSEN, in the *Revue des Cultures Coloniales.*

In view of the relative scarcity of good forage plants in tropical and sub-tropical regions, especially as regards those which can be used for sowing on the prairies, and for making into hay, the cultivation of which presents no difficulty, I should like to draw attention to the *Panicum monostachyum*, known in San Paulo (Brazil) as "capim cotingueiro."

There are several varieties of this plant, such as the "capim cotingueiro branco, preto, and roso."

The "cotingueiro roso" is the one principally found on the prairies, but we also find the other varieties mixed with it. According to the analysis made at the Agricultural Institute by Dr. Dafert, this grass is composed of the following substances:—

	Young Plants.	After Flowering.
The green plant contains percentage of water .	79·57	59·43

The dry portion consists of:—

	Young plants digestible.		After flowering digestible.	
Protein	12·83	7·83%	7·69	4·69%
Fat	4·95	1·09	2·54	0·56
Cellulose	41·29	. .	35·46	...
Non-nitrogenous matter	31·60	17·70	34·17	19·13
Pure ashes	9·33	...	20·14	...
	100·00	...	100·00	...

As shown by the above figures this fodder plant is one of the most suitable for cattle, mules and horses. This is the real prairie grass, and gives excellent crops. It can be recommended not only for its great value as fodder, but also for its easy cultivation and multiplication.

It will grow in almost any soil, even in pure sand, but of course not to such a size as in good soil. Even in very dry ground it will grow well. Once sown, it develops without further trouble, and prevents the growth of all other scrub or bad weeds, such as the "sapé," which is so disastrous here for other crops.

Under ordinary circumstances it is only necessary to clean the fields twice with a hoe, and later on remove the weeds once a year.

The "Panicum" multiplies so rapidly through seed, that it soon eliminates all other plants. I have planted it myself on scrubby land,

covered with "sapé," and always with satisfactory results. The cattle must be prevented from entering the fields during the first year, in order to allow the plants to ripen the seeds.

The fields of young grass are liable to be destroyed by bush fires in the dry seasons, but the matured plants suffer much less from this cause. It is therefore necessary to prevent bush fires by every means possible. Finally, I may remark that here a belief prevails that the plant drives away snakes. The leaves which are very hairy, exude a sticky substance, which is probably very objectionable to these creatures; I have at any rate never seen a snake on an improved prairie of "*Contingueiro.*"

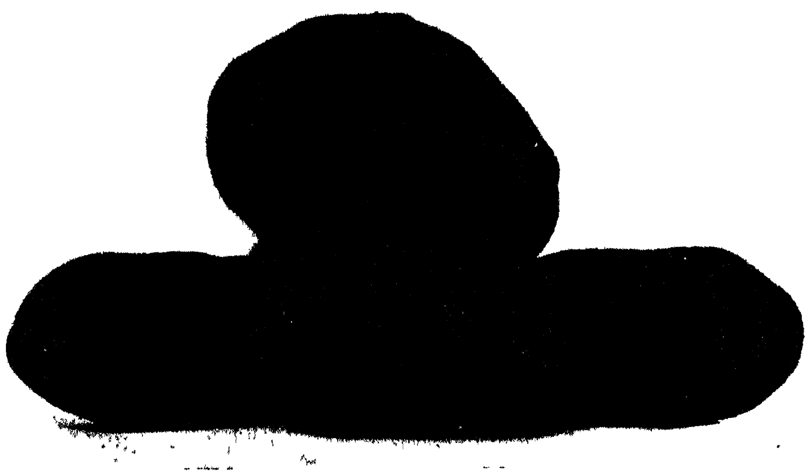
Thorough Cultivation.

In even moderately dry seasons it is exceedingly difficult to grow potatoes in the average stiff clay soils of the county of Cumberland. Mr. Neville Bosworth, of Beecroft, has, however, demonstrated that by means of thorough preparation of the soil it is possible to produce an excellent crop in an abnormally dry season. Mr. Bosworth was good enough to submit a sample of the tubers for inspection. They were in every respect excellent, and as even in size as one will see potatoes grown under the most favourable conditions of soil and climate.

The illustration now reproduced (from the *Station, Farm and Dairy*) shows a fair average sample of about half natural size. Concerning the crop, Mr. Boswell writes:—

"The land on which these potatoes were grown is situated on the uplands which lie to the north of the Parramatta River. The altitude is about 500 feet above sea-level. The district is not supposed to be adapted to the successful cultivation of root crops, but it is well known as a centre of the fruit-producing industry. The soil varies, but the particular piece of land on which the potatoes were grown may be described as possessing a heavy clay soil which is difficult to work,—parts somewhat freely with moisture, and hardens quickly when exposed to hot weather. The land, which was cleared some years ago, had not been cultivated for some time, and was covered with a thick rank growth of blade grass and bracken fern, intermingled with couch grass. A clay soil in this climate can only be worked when heavy rains have thoroughly saturated it to the required depth for cultivation, and last season this did not occur until the month of May, when the digging was put in hand. The process was as follows:—A wide trench was opened to more than the full depth of a new spade, then the spade was passed under the roots of the vegetation to the width of another trench, and the grass and fern thus removed were buried in the bottom of the first trench, then the second trench was opened and the soil placed on the top of the vegetable matter deposited in the trench: and this process was repeated until

the work was completed. The land was then left in the rough state to sweeten, but intervals of unseasonably hot weather so hardened it that when the time came to break it down the work of pulverisation was extremely difficult and entailed a great deal of labour. Having broken the soil down thoroughly, the work of planting was put in hand in the early part of October, the method adopted being to open the drill deeply with the hoe and to further deepen it with the spade; then a liberal dressing of bone-dust was sprinkled over the bottom of the drill and well incorporated with the soil, and after the seed was planted the drill was covered loosely with soil, but care was taken, too, that *all* the soil between the drills should be left in a loose condition. The seed, of the Brownell's Beauty variety, was cut down carefully to not more than three eyes, and dusted thoroughly with wood ashes. The drills ran from east to west and were rather closer



than usual—to afford as much shade as possible—but ample distance was allowed between the sets. Owing to the light and irregular rainfall the soil was comparatively dry at planting time, and afterwards no rain to speak of fell until the crop was harvested. When the plants appeared above the surface the drought had become confirmed, and as the deep cultivation had not permitted the growth of many weeds it was deemed unwise to disturb the surface of the soil by any after cultivation lest the heat of the sun should penetrate to the roots of the plants; but the loose state in which the soil had been left afforded sufficient facility for root development, and though so little rain fell yet there was still a little moisture left at the bottom of the drills when the crop was dug. The potatoes were of good quality, and there were very few small tubers. I attribute the success of the crop entirely to the care taken in the cultivation, for deep cultivation is more necessary in a hot than in a cold climate."

Farm Notes.

RIVERINA DISTRICT—October.

G. M. McKEOWN.

Sorghum.

Seed should be sown without delay in land which has been deeply worked and thoroughly pulverised.

The deep soils of the river frontages will give the best results; but wherever practicable, irrigation should be applied should the growing season prove dry.

Seed should be sown in drills about 3 feet apart, to admit of tillage being carried out during the growth of the crop. Eight to 10 lb. of seed will sow an acre. The best varieties are Planter's Friend and Amber Cane.

Maize

May still be sown to produce a crop for green fodder or ensilage. River flats, deeply worked, will give the best results, the higher lands being unsuited to the crop. Irrigation in a season such as this will be necessary.

Cow-pea

May be sown in drills for seed production about 3 feet apart, using about 20 lb. of seed per acre.

For feeding off or ploughing in, 45 lb. seed per acre should be sown. The black and clay-coloured kinds are the best.

Millet.

Hungarian for hay or green fodder should be sown at once, provided rain has fallen, in finely pulverised soil, using about 15 lb. seed per acre. The Japanese variety has also given fair results here.

Pumpkins and Squashes.

Sowing should be completed without delay. Alluvial flats should be selected, and the land deeply and finely worked.

The seed should be sown "on the flat," and not in raised mounds, as is sometimes done. Well-rotted stable manure should be used on the land, and the surface should be well mulched round the plants.

Running varieties should be planted 10 feet apart, leaving three or four plants in each group. Bush varieties may be sown 6 feet apart. Should the weather prove dry water will be necessary.

Melons.

Sowing should be completed as early as possible if rainfall has been sufficient. Water will, however, be a necessity under such conditions as now exist. Where the beds are watered it should not be applied to the surface, but so as to saturate the subsoil from a trench wl- should be closed after use. All beds should be well mulched.

Orchard Notes.

W. J ALLEN.

October.

Owing to the fact that in many districts there have not been sufficient soaking rains to saturate the subsoil, it will be necessary to use every possible means of retaining as much moisture in the soil as we can, in order to save the tree from undue suffering during the approaching summer, especially if it should appear that we are to be the victims of a continuance of the existing drought. Under no circumstances, therefore, should the ground be allowed to become baked or hardened through a lack of proper cultivation, nor should weeds or green manuring crops be allowed to remain in the ground one day longer than is possible, if they have not already been turned in, as anything found growing in the orchard at this time of year is pumping out of the soil the very moisture, which it should be our every aim to retain for the proper nourishment of the tree during the warm summer months to which we have to look forward.

In cultivating the orchard, use an implement which will leave the surface of the soil as level as possible, in order to prevent excessive evaporation.

All apple-trees should receive a thorough spraying with Paris green as soon as the petals have fallen, and before the calyx is closed. In applying the solution, use a very fine spray, and do not apply more than just sufficient to cover the leaves and fruit without any running off. In mixing, it is best to add 1 lb. of fresh slacked lime to every pound of Paris green. It will be found that some varieties bloom earlier than others, and, therefore, it will be impossible to spray all trees at the same time; but, during this month, all varieties of apple-trees will require to be sprayed for the first, and some the second time, for the destruction of codlin moth. If in previous years the apples have suffered from the effects of any of the various fungus diseases which attack this fruit, Bordeaux mixture may be used, to every 12 gallons of which 1 oz. of Paris green has been added, in this way killing two birds with one stone.

It will be well to get the bandages on the trees towards the latter part of the month, and these should be taken off and examined every ten days after the grubs have made their appearance, and all grubs and chrysalids destroyed by cutting them in halves with a sharp knife carried for the purpose.

Aphis on peach-trees has not as yet made its appearance to any great extent; but where any have appeared, the trees should be sprayed with either nicotine diluted or resin and soda wash.

Where passion vines are not yet planted the work should be pushed forward as early as possible, so as to enable them to get a start before the dry hot weather sets in.

Keep a strict watch on all refills, and if they show any signs of wilting, give them one or two buckets of water from time to time, until they get a good start.

Disbud all newly planted trees, leaving good shoots at least 4 inches apart along the trunk of the tree, and do not allow two or three shoots to start from the same place, as so many have done, but give each branch a separate hold of the main stem.

If the sap is well up, citrus-trees may be successfully budded this month. Keep all dormant buds and grafts well disbudded, so that the bud may get away good and strong. No suckers or shoots should be allowed to grow below the buds. It is also very essential that stocks should be cut back properly. The cut should be slanting, being slightly lower on the side opposite to the bud, and it is advisable to stake them, not only to prevent their being blown out, but to encourage a straight trunk. Where grafts have been put on old trees, they are even more liable to be blown off than small ones, and must be tied to prevent it. To do this, a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end, then, as the graft grows, it can be tied to it.

While working around trees watch for borers on the trunks and branches, as, when they are starting their work, it is very east to cut away the bark and find them, in this way keeping the orchard free of this pest.

As soon as the vines begin to grow, sulphur them at least once before blooming for mildew, and twice if the weather is very damp. In the coastal districts, it is well to spray them immediately with Bordeaux mixture, and should caterpillars of any kind be eating the leaves, add Paris green to the solution in the proportion of 1 oz. to 20 gallons. Repeat the sulphuring from time to time, giving as many as eight applications if the season is at all damp. This will pretty well keep the oïdium in check. Keep all vines well disbudded. I have noticed in many small vineyards that this important work is very often neglected. Never allow any branch to grow below the crown of the vine. To do this work properly, it will be necessary to disbud all vines from twice to three times.

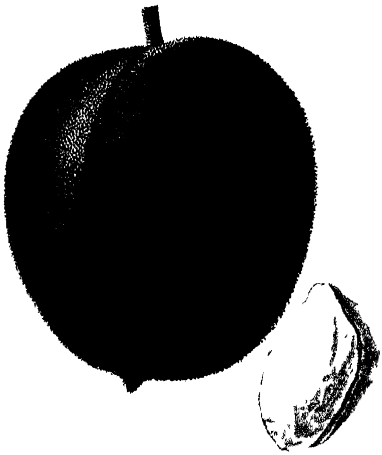
Reference to Coloured Plate.

Angelina Burdett.—Fruit, medium round ; skin, thick, dark purple, almost black, spotted with brown, and covered with blue bloom ; flesh, yellowish, juicy, and highly flavoured, a smack of gage ; freestone ; blooms about the third week in September ; ripens about the middle of January.

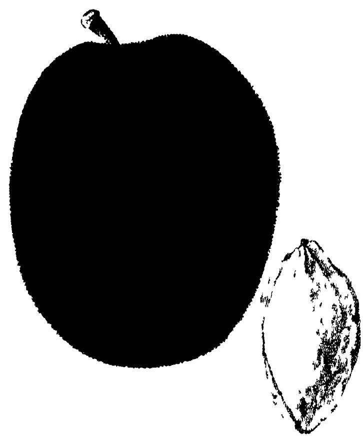
Prince Engelbert.—Tree upright, vigorous and productive, carrying its fruit in clusters close to the main branches ; fruit large, oblong, oval ; skin, dark purple, covered with a deep blue bloom ; flesh, yellowish green, juicy, and sugary ; freestone ; blooms about third week in September ; ripens towards the end of January.

Giant Prune.—Very large, dark crimson upon yellow ground ; flesh yellow ; flavour good ; freestone ; a good shipper, and makes a good jam ; one of Burbank's seedlings.

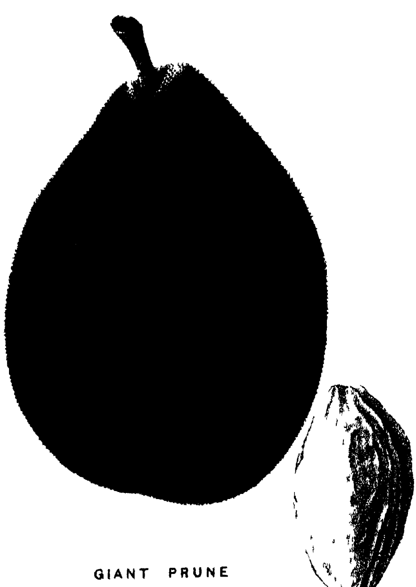
Belle de Louvain.—Tree vigorous, upright, heavy foliage ; fruit large, long, oval ; skin, purplish red, covered with a thin bloom ; flesh, a little coarse, juicy ; a very handsome variety ; blooms middle of September ; ripens middle of January ; has not cropped well as yet at the Wagga orchard.



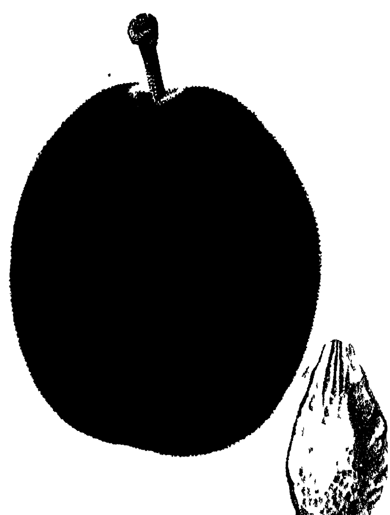
ANGELINA BURDETT.



PRINCE ENGELBERT



GIANT PRUNE



BELLE DE LOUVAIN.

S BURTON, LITH

PLUMS

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of October.

Vegetables.

It is to be feared that the drying westerlies, which have blown so persistently during the past few weeks, will, in places where due precautions in the way of mulching have not been taken, have almost nullified the effects of the fair rainfall of the earlier portion of last month. Still, we may at any time now enjoy plenty of rain. October is generally regarded as a rather trying month so far as tender vegetation is concerned, but in reality the conditions are more satisfactory than those which may prevail in September. At that time there is, perhaps, more rain, and scorching winds are not so frequent, but then the vegetable grower is so apt to be lulled into a sense of false security from which he is rudely awakened by the discovery of frost-bitten crops. Last month a considerable acreage, in small areas, all over the Coast, suffered from late and totally unexpected frosts, which destroyed tomatoes, potatoes, melons, and all sorts of early sown vegetables. This month the risk of such visitations in most coastal districts is practically over. There are records of frosts in October at Bathurst, Carcoar, Coonabarabran, Goulburn, Gulgong, Inverell, Moss Vale, Picton, and a few other places, and as late as November at Crookwell, Cooma, Gundaroo, Guyra, Orange, and Queanbeyan. In such places it is always well to keep readily available some means of shelter in the shape of old straw or light rubbish to be strewn over the young plants, or screens. If the evening is particularly clear and the air sharp, it is not a bad plan to set fire to a pile of damp leaves, or straw, or some material that will give off a dense smoke, which will act as a surprisingly effectual shield for the plantation. Where the ground has been carefully and deeply prepared and the drainage—natural or artificial—is efficient, it is easy to make a small quantity of moisture—rain or artificially-applied water—go a long way by the spreading of a good mulch of partially-decayed stable manure, leaves, straw, or other material that will mat together sufficiently to escape being blown away by the wind and which will keep the soil nice and moist. When water is to be applied the mulch can be lifted off to permit of a slight stirring of the soil to enable the water to soak well in and then replaced as speedily as possible. Where mulching is not practicable, the moisture can be retained in the soil by keeping the surface continually stirred to the depth of at least 3 inches.

Beans, French or Kidney, should be bearing well, except in the coldest localities in the State. During the month a few more seeds

had better be sown from time to time to keep a supply going if required, removing, as before suggested, old plants immediately they give indications of ceasing to bear well; but if possible avoid sowing either beans or peas in the same place until, at least, some other kinds of vegetables have been grown there. There are several important reasons why the growing of plants belonging to the same natural order should not immediately follow one another. By adopting a rotation there is less chance of increasing either fungus or insect diseases than if beans or peas or other legumes were to follow one another time after time. Again, certain orders of plants need a certain food to predominate in the soil for their healthy growth; a continuance of any one order would be a very severe drag on that particular food, and although this may be given in fresh manure for each crop, it has been found in practice that the soil becomes "sick" of the same crop.

A dressing of caustic lime occasionally to the vegetable garden will be found useful, applied at the rate of, say 1 ton to the acre, or even half a ton if lime is hard to obtain. Wood ashes contain a deal of lime generally, and an application of ashes will be found invaluable in vegetable culture. I can state this from practical experience on heavy soils and light or sandy ones. Even coal ashes are sometimes useful, if not used too extensively at a time.

Beans, Lima.—Sow either of the dwarf or runner varieties. This is a useful bean and should be grown in all vegetable gardens. Quite a few plants of the runner kinds will be found sufficient for a family.

Beet, Red.—Sow a little seed now and then during the month. Very little seed will suffice if a succession be kept up, for the roots will not, in all probability, be required for use every day, and there is no need to grow a quantity and then have to throw them away. Try the globe varieties, which are a great improvement on the long-rooted kinds. Sow the seed in drills about 18 inches apart, and thin out the seedlings when they are large enough to separate.

Silver Beet.—A little seed may be sown once or twice during the month, just to have some plants handy in case they may be required. If the Silver Beet plants, which have already been planted out, are treated well and are liberally manured with an occasional dose of liquid manure, they will continue to produce fine succulent leaves for a considerable time. Pull off a few leaves only at a time from each plant for use, and allow those that are young and tender to grow.

Cabbage.—Sow two or three times during the month a little seed in order to keep up a supply of seedlings for planting out. It may be necessary to use a little shading of light bush, or a bran or chaff bag cut in two and made with a frame will do very well; but keep the shading over the seed bed and seedlings as little as possible, otherwise the plants will become weak and unfit to bear the heat of the sun when they are pricked out.

Cauliflower.—Sow a little seed occasionally, and shade and water well.

Carrot.—Keep up a small supply by sowing a short row or two occasionally. Carrots are of much value in the household, for they

can be made use of in cooking for a variety of purposes, therefore it is important to keep up a full supply. Sow on ground from which cabbage or cauliflower has been removed and then manure need not be applied.

Celery.—Keep up a good supply, for well-grown celery is a great luxury during the hot weather, and every means possible should be taken to grow some. If water is plentiful there need be no difficulty. The ground should be made rich before planting by the application of good well-decayed farmyard manure. The addition of a little sulphate of ammonia or nitrate of soda will be an improvement for celery. This may be applied as liquid manure, say at the rate of 1 ounce of either substance to 1 gallon of water.

Cucumber. Sow a few seeds, if any more plants are required.

Cress and Mustard.—Sow a little seed from time to time if a supply is required. These plants are very useful during the summer for salads, but they will need to be watered well if the season is at all dry. Use plenty of good stable manure.

Capsicum or Chili.—If plants have not been raised, sow seed immediately. A very few plants should suffice a family. The Bird's-Eye and other small-podded varieties are useful for pickling in vinegar or making chili vinegar.

Egg Plant.—Seed may be sown and seedlings planted out as soon as they are large enough.

Kohl Rabi or Turnip-rooted Cabbage.—Seed may be sown in a seed-bed, and the seedlings afterwards planted out like cabbage. As there are many far better vegetables than this, it is hardly worth while to grow many plants. Use plenty of manure.

Leek.—Sow a little seed from time to time, and as soon as the young leeks have attained a height of 6 inches or more plant out in highly manured ground. Make shallow trenches, and plant in them rather deep after trimming the roots and tops off. During their growth supply with liquid manure occasionally, and should the weather prove dry supply them with water in abundance.

Lettuce. Sow seed in a seed-bed, and afterwards transfer the seedlings when they are large enough to a well-manured bed, planting them about 9 inches to a foot or even more apart, for some varieties grow a good deal larger than others. The lettuces should be kept growing as fast as possible, and should not be allowed to suffer any check, either in the transplanting or during their subsequent growth.

Melons, Rock and Water. Seed may be sown if more plants are thought necessary. Those plants already up from early sowings should be growing well by this time. Pinch the ends of the shoots as they grow to induce growth of laterals.

Maize, Sweet, or Sugar.—Seed may be sown now in almost any part of the State. In the cold districts it takes a considerable time to grow in comparison with the time taken in the warm coast districts.

Okra.—Seed may be sown, or plants already raised may be planted out.

Onions.—Sow a little seed once or twice during the month if a greater supply of onions are required than has already been provided

for. Apply a surface dressing of soot and salt mixed together in the proportion of half soot to half salt. This will be found to improve the growth of the onions.

Parsnip.—Sow a little seed in drills, in land that has been deeply dug, about 2 feet apart. Thin out the plants well when they come up.

Peas.—Sow a row or two occasionally to keep up a supply in the coolest parts of the State.

Potato.—Plant a few rows of potatoes in well-manured land. Select only for the seed potatoes those that are quite free from scab and signs of potato moth. Set the potatoes 3 feet apart about 6 or 7 inches deep in rows.

Pumpkin and Squash.—A few seeds may be sown during the month, and keep growing plants pinched back to induce growth of laterals.

Radish.—Sow a little seed of various kinds from time to time, and use the radishes before they grow too large and coarse.

Tomato.—If more plants are needed, sow as much seed as may be required. Plant seedlings raised from previous sowings. Train to supports as the tomatoes grow. Do not over-manure tomatoes, for if you do the plants will be liable to grow too luxuriantly to bear fruit.

Turnip.—Sow a little seed in drills.

Vegetable Marrow and Bush Marrow.—Sow a little seed, if more plants are required. Those plants which may have ceased to yield satisfactorily should be cleared away.

Flowers.

THE month of October is one of the most satisfactory periods of the year for a supply of flowers, and this is the time when the rose is generally at its best, more particularly the hybrid perpetual class, in which are to be found the very finest roses in existence. Unfortunately, as the hybrid perpetuals do not blossom so continuously as the teas and hybrid teas, they have lately become almost lost sight of by gardeners, who prefer those roses which are almost constantly bearing flowers, but the latter cannot compare in colour or texture with the former. One excellent variety of the hybrid perpetuals is "Mrs. John Laing," which produces beautiful roses almost as frequently as a tea. This variety should be grown in every collection.

Should hot winds occur during the month, the rose flowers will suffer terribly. The best kind of season for the rose is that when showers of rain fall frequently; then this favourite flower can be seen in its greatest perfection.

Tender annuals, which have been raised, should be transferred from the seed beds to their places in the garden. Shade a little when they are planted, and water well.

Chrysanthemums may be planted, or cuttings of old plants can be taken, and these will soon root, and make good plants for planting out.

General Notes.

Crushed Corn Cobs.

Mr. J. Polson, of Richmond River, writes: —I understand there are machines in the market for crushing corn cobs. I wish to know if the meal obtained is suitable for rearing and fattening pigs, and, if it is as good as pollard (equal weight). I should also like to know what quantity of cobs can be crushed per hour with power worked by one horse; what weight of meal would go to the bushel; and what is price of machine for one-horse power?

The Chemist, Mr. F. B. Guthrie, reports:—Crushed corn-cob (that is, maize cores stripped of grain and reduced to a meal) is not by itself suitable for fattening pigs. Compared with pollard, it contains rather more than half the nutrient matter as pollard, as the following table will show:—

		Corn Cob Meal		Pollard.	
Water			13.5		10.0
Ash			1.6		3.8
Fibre			35.3		5.2
Nutrient matter	Albumenoids	4.5	49.6	17.4	81.0
	Carbohydrates	44.5		58.0	
Fat		0.6		5.6	
			100		100

That is to say, 100 lb. of pollard contain 81 lb. of nutrient material, nitrogenous matter, starch, sugar, and oil or fat, whereas corn-cob meal only contains 49.6 lb.

There are available in Sydney, machines for grinding corn and cob together. The power required is two-horse; capacity about 5 bushels per hour, and cost £8 10s.

Concerning the value of corn and cob crushed together, Mr. Guthrie states that the meal has been profitably employed in pig fattening. The addition of oil-cake or molasses to material like corn-cob meal would be of advantage. The feeding value of corn-cob meal, meal of grain and cob crushed together, cocoa-nut oil-cake, and molasses are given in the following table:—

		Mixture—Half Maize, Half Cob	Cocoa nut Oil cake	Molasses.	Maize without Cob
Water		12.2	7.3	25.0	10.9
Ash		1.5	5.4	5.0	1.5
Fibre		18.7	9.7	. .	2.1
Nutrient matter	Albumenoids	7.5	17.2		10.5
	Carbohydrates	57.0	41.3	70.0	69.6
Fat and Oil		3.0	19.1	.	5.4
		100	100	100	100
Total nutrients ...		67.5	77.6	70.0	85.5
Albumenoid ratio ...		1 to 8	1 to 5¼	.....	1 to 8

Description of Fruits at Departmental Orchards.

Mr. Caleb Gambling, of Thornleigh, writes:—"In the *Gazette* for last May I was very pleased to see a beginning in reporting the results of testing fruit trees at the experimental orchards, as it is very much needed as a help to us fruitgrowers in selecting the sorts we need for our several requirements; but the notes should be much fuller in order to contain all the information required. The most important point is that fruits should be correctly named; but on page 515, in the report from Wagga, peach 'Alexander' is put down as the earliest, even before 'Briggs.' This is, I think, a mistake, especially as it is described as a freestone, when Dr. Hogg in his *Fruit Manual* says its only fault is its being a clingstone. My experience of this peach is that it is at least ten days later than Briggs, and, like nearly all the very early peaches, is only partly free and partly cling. I think the Wagga one must be another peach and not the true 'Alexander.' There is also another mistake, I think, with 'Early Crawford' and 'Foster.' The former is said to ripen in January, and the latter in February. I have had both for some years, and I invariably have 'Fosters' nearly finished pulling ere I begin on 'Early Crawford.' In Wickson's *Fruits of California*, where the peaches are placed in the order of ripening, 'Foster' is before 'Early Crawford.' The spelling of the names should also be correct. I think there should be no letter 'e' in 'Salway,' but two 'a's. I would suggest that all the kinds of fruits should be placed in the order of ripening, and to be more precise than to say 'one ripens in January and the other in February,' as there may be nearly eight weeks between them, and, as growers (or some of them) aim to get peaches following each other every eight or ten days to keep up a succession during the season, it would be likely to lead some astray. Again the lists do not seem to be in any order, alphabetical or otherwise. I think the information should be in columns, something as follows: name, size, use, quality, season, colour of skin and flesh, habit of growth, free or cling, and remarks. There is also another guide to help inaccuracies in peaches and nectarines, viz.: the size of the flowers, and the shape of the glands or the absence of them. Every care should be taken that is possible to get everything correct, as it is likely some one, wishing to get the earliest peach, and guided by this report, orders from some reliable nurseryman 'Alexander' and gets the true one, and on his fruiting it he may be inclined to bless (?) the party for giving him the wrong peach, when some one else was to blame.

"But, as Rome was not built in a day, we must not expect too much for a start, and I hope some other growers, better qualified, may be induced to give their experience and suggestions, and so help mutually in improving the *Gazette* in this particular."

In reply to which, the Fruit Expert, Mr. W. J. Allen, says:—Mr. Gambling's remarks in reference to Dr. Hogg's description are correct, but as doctors differ so do authorities, and the weight of evidence, as well as our own observations, differs from Hogg's, as will be seen by the following quotations:—The "Alexander" is an American variety, raised

in the State of Illinois, U.S.A., and described in Wickson's *Californian Fruits*—"Alexander" (Illinois), most widely grown as best early variety; fruit medium to large; greenish white, nearly covered with deep red; flesh firm, juicy, and sweet; bears transportation well; pit partly free." Wright, in his *Fruitgrowers' Guide*, vol. 3, p. 59, describes this peach as—"Fruit large, round; skin bright deep red on the sun side; flesh yellowish white, melting, juicy, briskly flavoured, and *sometimes* adhering slightly to the stone; tree hardy and free bearer; flowers large; glands on leaves round; an excellent very early variety, raised in Illinois, U. S. A.; ripe in July against a wall, earlier in an orchard house." The California Nursery Company of Niles, Cal., catalogue this peach as—"The best very early *freestone*; medium to large size; greenish white, nearly covered with a deep rich red; very juicy, sweet, and of good quality." Ferguson and Son, nurserymen, Camden, N.S.W., catalogue the same variety as—"Fruit large size, nearly globular; skin greenish white, purple in the sun; flesh greenish white, a little stained next the skin; half melting, juicy, rich and vinous; *freestone*; ripening (with them) 14th December." Our own observations are given in the *Gazette*.

It must be borne in mind that the period of ripening varies in different districts; for instance, the "Elberta" ripens in many places and on certain soils at the end of January (see report on H.A. College fruits) or beginning of February, while at Wagga it does not ripen until about the first of March. While there might not be such a difference in all fruits, yet it is just possible that there may be sufficient difference to place one fruit ahead of another in spite of authorities. We can only say what they are doing with us. A reference to the times of ripening of the "Early Crawford" and "Foster" at our H.A. College will disclose the fact that at this orchard also the "Early Crawford" ripened a few days earlier than the "Foster."

Spelling of "Salwey"—English authorites spell with the "e," Americans with the "a"; but as this peach is named after Colonel Salwey, who brought from Italy the stone from which this variety was raised, I presume we must follow the English authorities in this case.

No one knows better than myself that there is an endless lot of work to do, and many details which would be of interest to growers which might be kept, but we hope with additional assistance, if possible, to be able to devote more time to this work. Our present staff have their time fully occupied with their duties, and have not the necessary time to give to this, which is a study in itself.

HONEY VINEGAR.

IN response to inquiries as to the mode of making honey vinegar, the Viticultural Expert, Mr. M. Blunno, has furnished the following details, which may be of general interest:—The first step in the manufacture of honey vinegar is to convert the honey into wine (hydromel). Honey contains 75 to 80 per cent. of sugar, but not any, or very little, of the mineral ingredients for the development of yeast necessary for alcoholic fermentation; such ingredients must therefore be added.

That is done in this wise: Take 17 gallons warm water and dissolve in it 45 lb. honey; add to these the following:—

20 ounces Tartaric acid.
8 ,, Cream of tartar.
6 ,, Tartrate of ammonia.
2 ,, Phosphate of ammonia.
½ ounce Common salt.

When these ingredients have been thoroughly dissolved and the mixture has been allowed to cool down, add ½-lb. fresh brewers' yeast; stir the mass well, and place the vessel in a room where the temperature is from 75° to 80° Fahr. In the course of five or six days all the sugar of the honey should have transformed into alcohol. The result is hydromel, or honey wine. This is then removed to a cool place, where it is allowed to rest for a fortnight, when it is carefully racked into another vessel to enable the suspended matter to settle, when the clear liquid can be drawn off from the sediment. The sediment is mainly made of yeast, which can be used for transforming more honey into honey wine. The clear liquid is brought to a room where the temperature is about 90° Fahr. Here begins the process of acetification—that is, the transformation of wine into vinegar. The vessel is allowed to remain in ullage (that is, unclosed) so that the air may have access to the liquid. In order to expedite acetification some of this honey wine is placed in a glass vessel (about two-thirds full), which is placed in the sun or near the fireplace for several days until its contents are transformed into vinegar. The heat and the air will do this very promptly. The vinegar is then poured into the bulk, which, as previously mentioned, is kept in a room at a temperature of about 90° Fahr. When the whole quantity has become fairly strong vinegar, it is removed to a cool place where the temperature is from 50° to 60° Fahr.

The vinegar is generally turbid soon after made. It must be fined. To do this, Spanish clay, or any other ingredient the action of which is only a mechanical one, is used in proportion of one ounce Spanish clay to every 20 gallons vinegar. When it is clear, the vinegar is racked, the vessel is filled up to the bung, and is kept in the same cool place. For every quantity of vinegar drawn an equal quantity of honey wine should be added, so as to have the vessel always full; also, the bung should always be hermetically closed.

Where the vinegar is made for household consumption only it would probably be found inconvenient to keep on hand the necessary supply of honey wine to keep the vinegar cask full all the time. To overcome this difficulty the vinegar might be bottled and carefully sealed.

The Zante Currant.

Mr. Henry J. Fletcher, of Benevento, Mingelo, *via* Parkes, writes:—"For ten or eleven years some of us have been endeavouring to produce the commercial currant in this Parkes district (Central Division). All grape vines do well here—the Zante particularly well

in regard to wood, foliage, and blossoms; but, after much lavish promise, the vines have failed to yield fruit.

"The method of pruning has been at fault. Heretofore we have tied them to stakes, with crown about 18 inches from the ground and pruned back to two buds each season.

"The *Agricultural Gazette* for June, 1900, page 529, gave instructions for pruning so as to *prevent the abundant fruit falling off.* I immediately carried out those instructions for trellising and pruning on eighteen vines, leaving nine others growing to their original stakes, and did not prune them at all—let them grow wild.

"The *Gazette* plan proved eminently successful, though the season just passed was unkindly for any sort of grape. It was very gratifying to see such an array of bunches. I have to report, though, that *the berries* were irregularly developed; but am glad to say that another experiment completely overcomes that difficulty.

"The *Town and Country Journal* publishes the Greek method, ensuring the setting of the berries and *promoting bold fruit* as well, namely, by taking out a narrow ring of bark from $\frac{1}{8}$ inch to $\frac{1}{4}$ inch wide right round the vine trunk just when the fruit is setting. This seemed to me such an absurd, such a ruinous suggestion, I would not experiment on the newly trellised vines, but resorted to the nine unkempt, staked Zantes! I distrusted the idea so much that my courage almost failed me, and I only ring-barked alternate plants, that is, operated on four only. The wounds soon healed over again. On Christmas Day I had leisure to seek some ripe bunches for the table. The spectacle was an astonishment. On the unringed plants there was hardly a bunch retained and the berries were few, diminutive, irregularly developed and straggly. But all the four ring-barked vines looked overloaded with bunches; moreover, the berries were all of even size and crammed together as closely as it were possible to be. It was a lovely sight! The experiment was confirmed by an accident. The vine at the end of this row was not ring-barked. The winds had almost broken off one of the canes. It was hanging merely by a shred of wood and bark. This limb was weighted with bunches of fully-developed fruit, whilst the other three unmolested canes produced nothing worth picking.

"The *Agricultural Gazette* suggestion produces the shapely *bunch;* and the Greek plan promotes the development of *the berry.* Both systems succeed in retaining the fruit.

"I desire instruction on two things:—1. After erecting the Zante trellis, the first season's growth was about 12 feet along the top wire. Should I train the laterals of the same season down to the lower wire, or would it be preferable to prune off those and utilise the next year's offshoots? 2. What is the best system of curing the currant?"

In reply, Mr. ALLEN reports:—The vine may be spur-pruned, but where putting on heavy growth it will be found advantageous to allow the main leader of the vine to extend a good distance. For instance, if there were four vines planted and it was thought that they would do better by giving them more room, they may be treated in the manner shown in the sketch given in last month's *Gazette, p.* 948.

No. 1 vine to be tied to the top wire, No. 2 to the lower wire, No. 3 to the top wire, and No. 4 to the lower wire again, and so on. This will give more room to extend the leaders, and the best results may be obtained by this method of pruning. A two-wire trellis is all that is required, the bottom wire to be 2 feet from the ground and the upper one 18 inches higher. The curing of the currants may be done on either bags, hessian, or trays, so long as they are not exposed to too hot sun or damp atmosphere.

Asparagus.

More attention should be paid to the cultivation of this most desirable vegetable, and to those desirous of cultivating it upon a large or small scale perhaps the following notes may be of interest.

The soil best suited for it is a rich sandy loam, although it will thrive upon heavier soils, as is the case at Bathurst Farm, it being grown upon rather a heavy clayey loam made friable by applications of well-rotted stable manure. The land should be trenched from 2 to 2 ft. 6 in. deep, and thoroughly mixed with well-rotted manure.

To save time it is better to purchase strong roots which have been raised from seed two seasons previously. If raised from seed it would be the fourth season before strong heads would be produced for cutting. The beds are thoroughly prepared during the winter for the reception of the roots towards the beginning of spring, for if planted too early a number are apt to die. The beds should be 4 feet wide, with paths about 2 feet between, to allow of cutting without treading upon them. Two drills should be opened upon each bed from 18 inches to 2 feet apart, and the roots carefully spread in them about 1 foot apart, and the crowns covered by about 2 inches. Care should be taken not to expose the roots more than is necessary. The beds are then neatly raked over and a top-dressing of coarse salt applied, which is washed in by the rain. If strong roots were planted a cutting could be made the second season after planting, which would be in about fifteen months. The old method of cutting the young shoots several inches below the surface has given place to the method of allowing the shoots to grow from 5 to 6 inches high, which are then cut off level with the beds; this allows of the whole of the shoot being eaten, instead of only a portion, as by the former practice, and prevents injury from cutting other shoots below the surface. No stems should be allowed to grow during the cutting season, which should last from six to ten weeks, according to the vigour of the roots. If continued too long the plants would be considerably weakened. After this they should be allowed to grow, in order to store up nutriment in the root and give out shoots the following season, and should be kept free from weeds and receive liberal treatment with liquid manure and salt throughout the summer. After the stems have turned brown in the autumn they are cut close to the bed and removed; the beds are carefully forked over and given a good dressing of well-rotted manure several inches in thickness. In the early spring the beds are again forked lightly over, tidied, and a

dressing of salt applied. If carefully tended the beds will remain productive for many years.

If the asparagus plants be raised from seed it is preferable to only plant those which bear unproductive flowers, as the seeds produced by productive plants readily germinate and dirty the beds. Several varieties are under cultivation at this farm, including Connover's Collossal, Efurt Giant, Camden Park, Almera, Mammoth White, Giant Dutch, and Pallmetti. Up to the present Connover's Collossal has proved the superior—over an acre is under this crop, and it has proved a payable one.

The medicinal value of this vegetable has long been recognised; its diuretic properties make it valuable for affections of the kidneys. No garden is complete without a bed of it.—R. W. PEACOCK, Experimental Farm, Bathurst.

THE DELIVERY AND CONTROL OF MILK IN COPENHAGEN.*

THE control of milk in Copenhagen is directed by a Board of Health, with the aid of the sanitary police of the city (consisting of 7 doctors, 1 inspector, 5 sergeants, and 19 constables), and having a grant in 1901 of £6,000.

A municipal laboratory also has a grant of about £150, and carries out all necessary analyses. In 1900, 1,632 samples of milk were analysed, taken promiscuously from the delivery vans of the retail dealers. Twenty-three of these samples were found to be adultered, viz. :—

	No of Analyses	Adulterations.
Milk from the cow	125	
,, Separated	101	17
,, Skimmed	50	
,, Pasteurised	281	6

The penalties, which are pretty heavy, including imprisonment or a fine up to £11, do not sufficiently explain the smallness in number of frauds.

Another reason is, the general honesty of the people, who do not patronise fraudulent dealings of any kind, and who facilitate the work and efficiency of the inspectors. The inspections are rigorously carried out, and the interested parties submit without a murmur. There has also to be taken into consideration the abundant supply of good milk in the market, the price of which for the best quality does not exceed 1½d. per pint. Besides, the competition which exists amongst the dairies, and their anxiety to keep up a good name for their supplies, are a guarantee, not only of their honesty, but also of their keeping a sharp control over their employees.

The fact that machinery is almost exclusively used in all operations, such as pasteurisation, bottling, &c., simplifies this considerably.

Finally, the dairies find an advantage, from their customers' point of view, in selling their products after they have passed a supplementary official inspection, which guarantees the quality in a special manner.

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* From the "Bulletin de la Société des Agriculteurs de France."

The Board of Health recognises the following classification of milk:—Milk from the cow, pure, partly separated, controlled milk for infants, and pasteurised milk.

So far, no absolutely strict rules have been adopted with regard to the natural milk from the cow. The Board of Health propose the following grading:—If containing under 5 per cent. of butter-fat, to be considered as second-class, and if over 5 per cent. as first-class.

The members of the Municipal Council have made other proposals, as follows:—The natural milk must not contain less than 2·75 per cent. of butter; the partly-separated not less than 1·75 per cent; below 1·75 the milk is to be considered as separated.

The matter will be shortly discussed by the Council, and a definite standard adopted. What is called controlled milk can only be sold by a dairy on the following conditions:—The cows must all be examined by an authorised veterinary surgeon at least once a month, with the disposal by him of those declared to be unhealthy; prompt advice to the veterinarian of any case of sickness, and the prompt carrying out of his directions as regards hygiene, ventilation, the draining and cleansing of the sheds, and the grooming of the cattle.

With regard to milk for infants, the proprietor must not use any forage detrimental to the object. The importance of this class of milk, which should vary according to the age of the infant, is very great in a country where feeding at the breast is less and less practised. The veterinary surgeon presents a monthly certificate, and the proprietor, in attaching his signature at the bottom of this, affirms that he has followed the directions of the veterinarian. In submitting to the different controls, the dairyman acquires the right to sell his milk under a certain name, which commands a greater commercial value. But as regards both first and second-class milk in Copenhagen, according to the results of the analyses, as well as by the other causes enumerated, it seems to be almost entirely protected from adulteration.

Railway Freights on Vegetables in France.

Beside the land particularly devoted to vegetables, such as market gardens in the immediate vicinity of large towns, there are many districts very suitable as regards soil, climate, and fertility for producing these on a large scale.

The gardens in the suburban districts are generally devoted to the cultivation of such vegetables, as by reason of their more remunerative prices will stand the heavier general charges for the land and hand labour. The cultivation of the cheaper classes of vegetables is necessarily carried on in more distant country districts where large areas of land can be obtained more advantageously. This description applies to such plants as cabbages, cauliflowers, onions, carrots, turnips, parsnips, &c., which are sold in large quantities. The production of these is very large, and they constitute an important addition to the green vegetables consumed in the large centres of population, particularly in Paris. None of these cheaper vegetables can bear

very heavy transport charges when sold at low prices, and, in order to make these remunerative, the cultivators interested in the matter have requested that the freights shall be reduced.

Their request received a favourable reply from the Orleans Railway Company, which has submitted for the approval of the Minister for Public Works the following tariff for carrots, cabbages, turnips and parsnips in minimum waggon loads of 5 tons:—

		Per kilometre.
For the first 60 kilometres	... ...	8 centimes per ton.
60 to 100 ,,	... ...	3 ,, ,,
100 to 250 ,,	... ...	2 ,, ,,
250 to 400 ,,	.. ..	1½ ,, ,,
400 and upwards ,,	. . ...	1 ,, ,,

With an additional station charge of 40 centimes per ton.

These rates work out in English as follows per ton (total charges):—

	s.	d.		s.	d.
For 17 miles	2	0	For 107 miles ...	6	1
34 ,,	3	6	120 ,, ...	6	4
40	4	2	133 ,, ...	6	8
47	4	5	150 ,, ...	7	1
53	4	8	166 ,, ...	7	6
60	4	10	200 ,, ...	8	1
73	5	3	266 ,, .	8	4
83	5	7	300 ,, ...	9	3
93	5	10	333 ,, ...	10	2

The removal in bulk of these vegetables from the railway stations to the markets in Paris costs generally from 2s. 9d. to 3s. 7d. per ton. These details will enable a grower to calculate the profits per acre. The above advantageous arrangements ought certainly to aid in developing the culture of these vegetables in numerous districts, for, as we said before, vegetable growing cannot be confined to the market gardeners in the neighbourhood of the towns, as the ever-increasing growth of population in the large centres and, notably, in Paris, naturally implies the extension of the culture of cheap vegetables which constitute such a large portion of the town food supply.- H. Tuzet in the *Journal de l'Agriculture.*

Co-operative Agricultural Societies in Denmark.

Co-operative dairying societies have rendered very important services in Denmark, as will be seen from the following figures, extracted from recent statistics. The first co-operative dairy in Denmark was established in 1882. To-day there exist 1,032, which last year treated about 4,000 million pounds of milk (equal about 400 million gallons), valued at £7,000,000. The expenditure on these establishments amounted to £1,200,000, the cost of each varying from £150 to £2,200. Adding sundry expenses, the total capital invested in these establishments amounts to £1,500,000. The number of farmers and landowners who belong to them is about 150,000, possessing altogether 858,000 cows.

The butter produced last year weighed 68,000 tons, and each pound required 26½ lb. of milk. The price of the butter does not seem to have varied very much (except in 1894, 1897, and 1898), as will be seen from the following table:—

	Per cwt. s. d.		Per cwt. s. d.
1886	108 8	1893	111 1
1887	110 2	1894	98 4
1888	105 9	1895	100 8
1889	111 3	1896	102 1
1890	106 9	1897	99 8
1891	111 3	1898	98 9
1892	114 0	1899	106 4

Another industry which forms a part of Danish agriculture—the production of eggs—tends also to be worked on co-operative principles on a large scale.

A report published in the Danish *Agricultural Gazette*, in August, 1899, mentions the formation of a co-operative company for the sale of eggs. This society, known as the Danish Mercantile Egg Export Company (Dansk Andels Oeggesport), had only 1,900 members in 1895, in six districts, and used a central store for collecting and despatching the eggs. The progress has since been rapid, as the following statistics show:—

	No. of Members	No. of Districts	Sales
1895	1,900	6	80,000
1896	14,000	260	700,000
1897	16,000	320	1,300,000
1898	18,000	340	1,650,000
1899	22,000	365	2,194,000

The other co-operative societies for the sale of eggs, although not of such importance as the one mentioned above, represent a turnover of not less than £60,000 in 1899. In adding this sum to the amount realised by the former company, we get a total value of eggs sold in 1899, by the different co-operative companies in Denmark, of £193,000. This is in a country where the soil is, generally speaking, very poor, and where the cattle have to be stall-fed throughout a long and rigorous winter.—From the *Bulletin de la Société des Agriculteurs*.

Deterioration of Horse Stock.

I have, during the last few years, heard a great deal of the deterioration of the Australian horses, and the difficulty in obtaining remounts for the Indian, African, or Chinese troops. A great deal has been written as to the sort of horse required for the different branches of the British army, but cannot say that I have yet seen or heard how that is to be brought about, other than by suggessions, many of which I cannot accept as the correct line to start upon. I would not, in the first place, accept a grade stallion, but should say, let that gentleman be at least thoroughbred, whether blood (racer), hackney, hunter, or Cleveland Bay, the blood for choice, provided he is of sufficient size

and sound constitutionally.* The mare may be so-called grade, if active and vivacious and good-tempered, and, of course, the shape required as near as possible. This may produce the charger or troop horse. For the gun-horses I would suggest the Cleveland or English hackney to mate with good, active, light farm mares, with action, and able to trot at a fair pace, and not too heavy for the farmer to ride or drive in his market or spring cart. That horses of these sorts should be at the service of the public, farmers, and others, at a nominal fee for approved mares, with right to purchase all or any of the progeny at, say, 1½ years, at a nominal price, from the breeder, who would by these means take care that the foal was not stunted in his growth, but be kept in good growing condition up to weaning, and from that till time for his being taken from the breeder, when he should be quiet to handle. I also think that breeders would do well if it could be arranged with the Police Department to have the fillies at, say, 3 or 3½ years old roughly broken for, say, 1½ years; this would, I think, be a great help in producing mares of a good stamp. They would, in the hands of the police, be carefully trained, fed with a liberal ration, and have sufficient work to develop muscle, as well as having them tractable when required for breeding purposes. Of course, there would be a few breakdowns but that should not be considered if from legitimate work; but from ill-usage or knocking an eye out, then I think the man in charge of the animal would, and should, suffer. I have often been surprised at seeing valuable mares sent to high-priced horses and returned in frightful condition, more like as if they had been in a pound where forage and grass was scarce than to a so-called first-class stud establishment. I do not wonder at seeing some of the weedy racehorses, when it is taken into consideration what their mothers had to go through to find nourishment for them and the foal she was carrying. Again, many are rearing horses by allowing them to run in a sheep paddock where the mares can hardly find sufficient food for themselves without having a sucking foal at foot and carrying another. There is no doubt in my mind but horse-breeding is a lottery, and always has been, so far as hackney saddle-horses are concerned, even the horses of years ago; but then they had a great advantage over the horses of the present day, having plenty of room to roam and the best of natural pastures; and after being branded and otherwise dressed were at liberty till 4, 5, 6

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* Perhaps a little explanation will be necessary *re* the horses mentioned, viz.: Hackney stallion, as he is by many not regarded as thoroughbred. The horse I would take as a sample is well known to most frequenters of Royal Agricultural Shows, such a horse as Lord Derby, Jr., imported by Mr. P. Charley, of Richmond, and appears in English Hackney Studbook, running back many generations.

The hunter, a good description, will be found in the horse that I believe was awarded a special prize at Royal Show, Sydney—Robert Emmett, who also boasts of a long pedigree.

The Cleveland has also a studbook, and should, like the others, be pure of his class.

What I regard as the grade stallion is something like the following: Say a mare, perhaps thoroughbred, produces a filly by an Arab, this filly produces another by, say, a Yorkshire horse, and the latter produces a colt by a hackney or roadster, good looking, but most certainly not likely to produce a desirable class of stock. Again, a mare thoroughbred has filly to Cleveland or hackney, this filly produces a colt to an Arab, again not likely to produce the stock required. For my own part, I would prefer an inbred, sound (constitutionally), racing breed.—G.S.S.

years and more before being broken, and not put to hard work until they were set and furnished, except for the making up they received in the stable when they showed signs of what they were likely to turn out as regards usefulness. One great thing against the horses of the present day is that there are not the large herds of cattle at large that required the best horses and men at mustering and camp drafting. Now, cattle are in paddocks, so that almost any old crock will do for riding round the fences of either sheep or cattle paddocks, so that the shepherd and smart stockman is almost a thing of the past, and the horses have followed. Long journeys are not required to be taken on horseback as formerly. Buggies, coaches, and the railway have done away with that, and people can travel faster and more comfortably than the old pioneer squatter of 40 and 50 years ago, or, I may say, even the last 20 years; so that the usefulness of the saddle hack and roadster's usefulness had passed till the prices obtainable for them would not pay the producer, and the wool and mutton producers took the places of both horses and cattle on most of the stations of this State. One stallion will fertilise, say, 75 mares, and for that reason I would condemn any sire not of a type definitely fixed and of lineage known for generations to get reliable stock, and recommend the thoroughbred and come back to pure or as nearly pure as possible. Twenty per cent. or more of the mares may not throw to type required in first instance, but still there is a better chance from the thoroughbred than from any cross. I would advise never part with the mare that throws good stock.—G. SIDNEY SMITH, Stock Inspector, Bathurst.

THE INFLUENCE OF SPACE BETWEEN POTATO PLANTS ON THE PERCENTAGE OF STARCHY MATTER.

IN one of the preceding numbers of the *Journal de l'Agriculture* we recommended a space of 24 in. x 12 in. between potato plants, which figures are derived from the results of frequent experiments made during 10 years at the Agricultural Station of Cappelle.

The space of 24 inches between the rows is what we allowed both in the experimental fields and in large cultivations. The space between the plants in the row is 12 inches in experimental fields and 12 to 16 in large cultivations, according to the state of the manure and the working of the soil. We have no trouble at all in the work of keeping the plants in order, as any visitor to our farm can see, and the spaces are suitable for all agriculture as regards the work, the question depending on the width of the earthing-up and trenching machines. The price of the seed potatoes is an insignificant item compared with marked increase of starchy matter produced per acre, as shown by the annexed tables of results obtained in our experiments. The increase in the crop compensates fully for the large quantity of seed used.

We give below the results obtained from the "Blue Giant" species, which it seems requires a somewhat large space on account of its extraordinary growth of leaves. We also have the results of the "Fleur-de-Pêcuer," "Jaune Rond," and "Richter's," which are all alike on this point.

It is in the experimental fields that these results of the spacing have been obtained, and we use them also for potatoes intended for making starch or farina, as well as for seed potatoes.

Not only the cultivators on a large scale (as most of them are in our district) should profit by these experiences, but also the medium or small sized farms, where the spacing of the plants is often exaggerated and out of proportion (there being too large a space between the rows and not enough between the plants on the rows, the opposite not often occurring). For small cultivations the question of the size of machinery disappears, as the work is always done by hand.

In light and well-manured soil it is even an advantage to have the plants closer, as we recently observed in Holland in a vegetable garden where the plants were 12 inches apart eachway, the gardener stating that he had progressively reduced the spaces in order to realise a larger profit. But the space of 12 inches on the rows seems to us to be the limit, and, if smaller, it results in a crop of small potatoes, as they are too close, and make a bad use of the manure and resources of the soil.

What we specially desire to caution against is the practice of having too large a space between the rows, and the plants very close together in the rows, as this is altogether wrong.

TABLE FOR THE "BLUE GIANT."

	Space in inches	Number of Plants per acre.	Production: Weight.	Production: Anhydrous Starch.	Per Cent.
			tons cwt	tons cwt.	
1. Whole potatoes	24 x 20	13,500	16 0	2 19½	18·52
Sprouted and weighing 3½ oz	24 x 12	22,500	17 14½	3 8	19·15
2. Whole potatoes	24 x 20	13,500	14 13	2 14	18·41
Not sprouted, weighing 3¼ oz	24 x 12	22,500	16 3½	3 1	18·90
3. Cut in pieces of 1½ oz.	24 x 20	13,500	12 12	2 9¼	18·35
Sprouted	24 x 12	22,500	14 8	2 13¼	18·41
4. Cut in pieces of 1½ oz	24 x 20	13,500	12 4	2 5	18·39
Not sprouted	24 x 12	22,500	13 1	2 8	18·46

M. DESPREZ.

LINCOLN RED SHORTHORNS.

THIS breed of cattle is rapidly coming into prominence in the dairy world. A couple of years ago the representatives of this breed won first and second prizes at the Royal Agricultural Show of England in the milk and butter test, and this year the breed scored a signal success at the Spring Show of the Royal Dublin Society in a similar test. The Lincoln Red Shorthorns, as far as its name is concerned, is, comparative speaking, a new breed, that is, if it can be called a distinct breed. It has a herd-book solely devoted to the breed, but the animals have all the characteristics of the ordinary shorthorn, the exception being that all representatives of the breed must be red in colour, and hence the name. Writing in the "Journal of the Royal Agricultural Society of England" in 1888, Mr. Frederick I. Cooke, who had been appointed judge in the farm competition confined to

Nottinghamshire and Lincolnshire, stated :—"It would be difficult to speak too highly of the types of live stock which are to be found in Lincolnshire farms. The prevailing breed of cattle is the Shorthorn, although the term is perhaps a little too general to describe them with sufficient accuracy and justice. There is no doubt that many of them still retain, in some degree, the distinctive points of the 'Old Lincolnshire Ox.' The constant use of pure-bred bulls upon cows with some of this blood about them has at length developed the celebrated modern animal which has for so many years been shown in great perfection at the large fairs of the country, whence they have been eagerly bought and widely distributed. The best cattle of to-day are of the rich red colour which has been prized and preserved for so many generations. They are both deep and wide of frame, have for the most part down-pitched horns, and develop into great size and weight if allowed time to do so. But perhaps they are most of all remarkable for the fleshiness of carcase, which the butcher is sure to find with them, a matter of more and more importance in catering for modern tastes."

Writing further on, in his article on the farm of Mr. Faux, he says: —'Mr. Faux is a well-known breeder of pedigree Shorthorn cattle, and at the first visit of the judges to the farm he had selected for competition, they found upon it an astonishing number of live-stock. All the cattle are bred upon the place, and include a fine herd of seventy milking cows, of which several have proved their quality, or that of their descendants, in the show-yard."

Regarding results obtained from the produce of the seventy cows it was estimated they averaged at the rate of £12 per cow for cheese alone, besides the amount of milk given to the calves.

Further on, in speaking of the farm of Mr. Lynn, of Stroxton, the writer states :—"Mr. Lynn is the happy possessor of an extremely valuable and well-descended herd of Bates' Shorthorns, and his side-board overflows with the spoils of the show-yard."

Such were the criticisms, in 1888, of the cattle of that portion of the country in which the Lincolnshire Red breed now has its headquarters. Since then the breed in question has been taken up and brought into prominence by those most interested therein, and with what success the following results show. One of the best-known breeders of Lincoln Red cattle, namely Mr. Evans, took three of his herd to Dublin Spring Exhibition to compete in the milking trials, and he obtained first, third, and fourth places—a thoroughbred Jersey having obtained second honors. The following was the result of the test which was carried on on the same basis as the milk test at the London Dairy Show, wherein points are given for the milk yield, and for the amount of butter fat and other solids :—The first prize cow, Star III., yielded 100 lb. 12 oz. of milk in two days, testing 4·95 per cent. of butter-fat, and 8·88 per cent. of other solids. This represents a daily average of 50 lb. 6 oz. of milk, yielding 2½ lb. of butter-fat, or nearly 3 lb. of commercial butter. Very few cows have done better than this in a show-yard trial, and if many representatives of the breed are capable of doing anything like this they would be a welcome addition to

Australian dairy herds. The third prize cow gave 43 lb. 2 oz. of milk, testing 4·75 per cent. of butter-fat, and 8·33 of other solids per day. The fourth prize winner, also a Lincoln Red, gave 56 lb. 1 oz. of milk per day, testing 3·70 of butter-fat, and 8·74 of solids other than butter-fat. This cow had been 60 days in milk at the date of the test.

The following table, taken from the English "Live Stock Journal," gives the milk yields in 1900 of 36 cows of the breed, also the property of Mr. Evans. The milk was weighed twice daily, and the cows are all entered in the herd book of the Lincoln Red Shorthorn Association:—

Name of Cow.	Date of calving. 1900.	Calf.	Total yield in lbs.	Days in milk.	Average per day.
Fairy 3rd	Jan. 1	3rd	6,170	273	22·6
Quantity	,, 15	3rd	9,242	308	30·0
Josephine 2nd	Feb. 4	1st	7,426	294	21·5
Burton Fairy	,, 5	1st	4,677	217	21·5
Isse 2nd	,, 8	2nd	7,655	238	32·1
Plenty	,, 9	3rd	10,180	322	31·6
Coa Fox	,, 27	5th	10,129	308	32·7
Pride 2nd	Mar. 1	2nd	5,168	203	25·4
Ruby Spot	,, 12	1st	8,274	308	26·7
Plentiful	,, 26	3rd	10,205	315	32·3
Burton 3rd	April 23	1st	7,773	336	23·1
Spotted	,, 26	7th	11,282	350	32·2
Yellow and White	,, 27	6th	7,805	266	29·3
Beauty Star	,, 30	2nd	5,874	217	27·02
Burton Ruby	May 7	6th	12,244	337	36·3
Saxilby	,, 16	3rd	6,090	245	24·8
Bountiful	,, 21	4th	8,086	266	30·3
Judy	,, 24	6th	9,938	273	36·4
White Foot	,, 26	6th	8,922	301	29·6
Huttoft	June 5	3rd	9,357	287	32·6
Sissy	,, 23	3rd	8,635	280	30·8
Pansy	,, 23	2nd	8,217	259	31·7
Molly Fox 2nd ..	Aug. 1	2nd	6,094	259	23·5
Rose 2nd	,, 11	1st	5,056	280	17·6
Saxilby 3rd	,, 22	2nd	6,333	231	27·4
Cork 2nd	,, 24	1st	7,260	245	31·1
Cross 2nd	Sept. 9	1st	5,876	280	20·9
Primrose	,, 10	1st	7,674	294	26·1
Chance	,, 16	3rd	10,409	266	39·09
Yellow Isse	,, 17	3rd	7,405	294	25·1
Fashion	,, 19	4th	4,807	210	23·3
Bertha	Oct. 6	6th	9,425	217	43·4
C. Star 2nd	,, 13	2nd	7,092	266	26·6
Florence	,, 25	5th	8,975	343	26·1
Spot 2nd	Nov. 12	1st	4,953	210	23·6
Bonny	Dec. 9	4th	8,595	287	29·5

Thirty-six cows produced 282,753 lbs. milk. Average per cow, 785 gallons.

While not an extraordinary average for an English milking herd, 785 gallons per cow per annum must at the same time be considered praiseworthy, especially as the fat tests, judging from the cattle that were competing at the Dublin Exhibition, seemed to be higher in this breed than in the ordinary Shorthorn.

From what can be gleaned, it would appear that the Lincoln Red breed is the result of using for generations Shorthorn sires on the red cattle of Lincolnshire.—M. A. O'Callaghan.

Market Review.

Board for Exports, Bridge-street,
Sydney, 20 September, 1902.

POULTRY, &c., received at the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits.	Hares.
1902.					pairs.	
January ...	6,266	1,677	197	372	576	....
February ..	12,593	3,416	326	297	....	....
March ...	17,228	2,087	324	846	6,502	80
April ...	25,011	4,916	257	186	9,751	896
May ...	22,605	2,382	42	440	36,828	1,800
June ...	9,754	971	26	288	32,756	17,848
July ..	3,484	35	4	74	18,060	17,064
August ..	1,068	5	5	53	7,522	20,484
Totals .	98,009	15,489	1,181	2,556	111,995	58,172

Besides the above, the following were received :—

1902.		
January...	 270	packages butchers' sundries.
February	 296	
March ...	 655	
April ...	 225	
May ..	 218	
June ...	 187	
July ...	 64	
August ...	 23	
Total	 1,938	

POULTRY, &c., delivered from the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits.	Hares.
1902.					pairs.	
January	9,548	1,166	183	170	1,566	96
February	12,921	1,075	563	517	348	300
March	11,833	2,018	390	630	3,709	136
April	10,645	2,192	332	213	4,896	122
May	22,944	3,172	89	479	8,679	972
June	5,383	459	28	226	15,699	5,248
July	7,296	3,684	54	303	57,510	18,288
August	2,407	3,152	5	27	14,280	21,404
Totals... .	82,980	16,918	1,644	2,565	106,687	46,566

Besides the above, the following were delivered :—

1902.			
January ...	... 609	packages	butchers' sundries.
February ...	... 262	,,	,,
March ..	... 667	,,	,,
April ...	... 225	,,	,,
May ...	... 234	,,	,,
June .	161	,,	,,
July ...	.. 215	,,	,,
August ...	... 37	,,	,,
Totals	.. 2,410	,,	,,

TABLE from the Board of Trade Returns showing the total quantity of Butter imported into the United Kingdom in the month of June, 1900, 1901, 1902, and for six months ended 30th June, 1900, 1901, 1902.

Butter.

Country.	Month ended 30th June.			Six months ended 30th June.		
	1900	1901.	1902	1900.	1901	1902.
Colonies—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Canada	8,546	19,166	24,023	11,034	23,357	37,596
New South Wales	2,340	749		60,001	48,571	17,503
New Zealand .	10,985	1,360	339	131,723	146,088	144,649
Queensland ..		.		1,545		20
Victoria . . .			154	150,893	127,408	61,661
Total	21,871	21,275	24,516	355,196	345,434	261,249
Foreign Countries—						
Denmark .	130,241	149,800	140,497	782,283	809,213	867,168
France .. .	34,925	31,262	42,435	158,584	144,139	169,781
Germany . .	1,375	598	351	31,860	23,238	22,734
Holland	36,428	37,928	44,151	133,963	148,947	166,934
Russia ..	20,753	42,744	48,818	87,028	137,505	207,222
Sweden ..	11,946	12,969	11,165	96,376	96,508	90,620
United States ..	1,567	11,957	296	6,910	82,872	30,639
Other Countries ..	9,302	7,554	15,894	82,216	77,226	103,883
Total	246,537	294,812	303,607	1,379,220	1,519,648	1,658,981
Grand Total	268,408	316,087	328,123	1,734,416	1,865,072	1,920,410

TABLE from the Board of Trade Returns showing the quantity of Butter imported monthly into the United Kingdom from the Colonies and from Foreign Countries for the year 1902.

Butter.

Date.	Colonies				Foreign Countries.		
	Australia.	Canada.	New Zealand	Total.	Denmark.	France.	Germany
1902.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
January ..	53,796	4,065	44,593	102,454	148,678	23,977	6,396
February ...	20,441	1,298	41,048	62,787	136,592	21,925	7,551
March	1,474	1,860	20,967	24,301	134,031	21,662	4,696
April . ..	109	1,029	33,856	34,994	164,019	25,039	3,295
May ..	3,210	5,321	3,846	12,377	143,351	34,743	445
June .	154	24,023	339	24,516	140,497	42,435	351
Total ..	79,184	37,596	144,649	261,429	867,168	169,781	22,734

Butter—continued.

Date.	Foreign Countries—*continued.*						Grand Total.
	Holland.	Russia.	Sweden.	United States.	Other Countries.	Total.	
1902.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
January ...	19,575	11,205	19,013	9,584	17,757	256,185	358,630
February ...	15,757	16,088	14,381	13,701	19,818	245,813	308,600
March	17,853	24,228	14,920	4,716	16,101	238,207	262,508
April	30,551	54,350	14,190	1,997	15,687	310,128	345,122
May	39,047	52,533	16,951	345	17,626	305,041	317,418
June	44,151	48,818	11,165	296	15,894	306,607	328,123
Total ..	166,934	207,222	90,620	30,639	103,883	1,658,981	1,920,410

TABLE from the Board of Trade Returns showing the total quantity of Cheese imported into the United Kingdom in the month of June, 1900, 1901, 1902, and for six months ended 30th June, 1900, 1901, 1902.

Cheese.

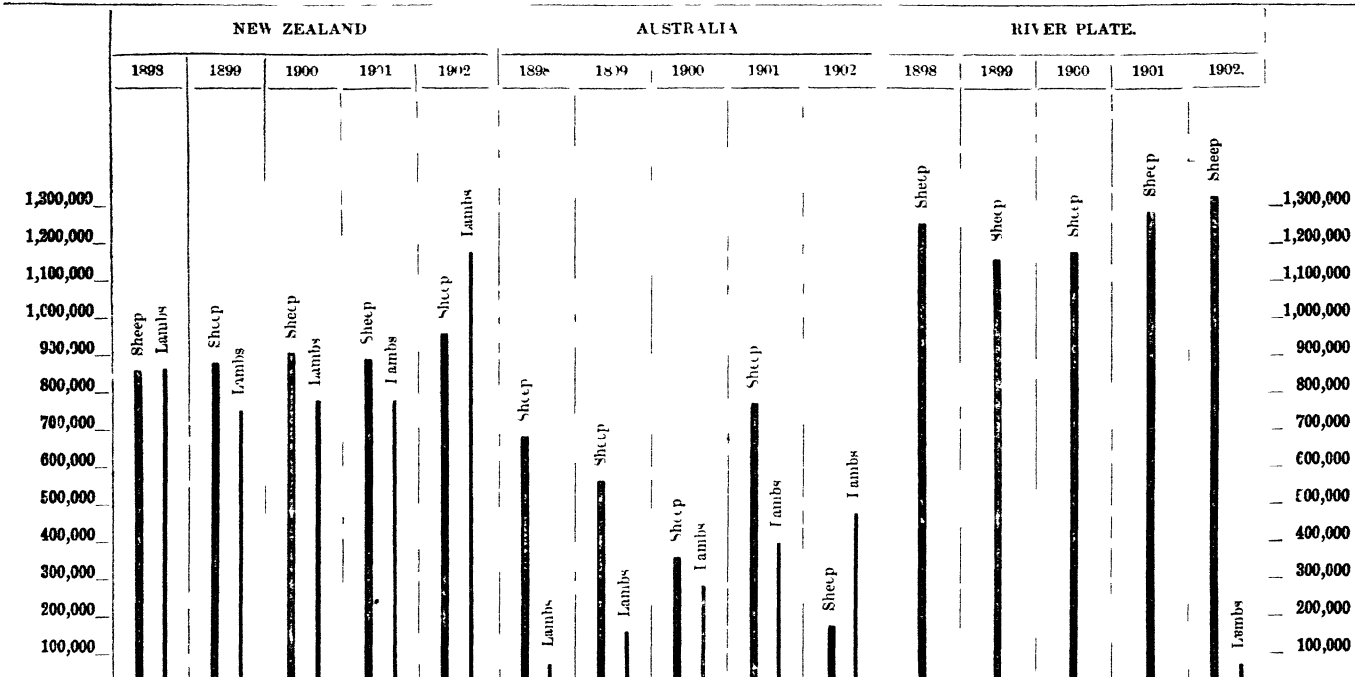
Country.	Month ended 30th June.			Six months ended 30th June.		
	1900.	1901.	1902.	1900.	1901.	1902.
Colonies—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Australia ...	} 12,945	{ 6,362	.....	} 79,444	{ 146	1
New Zealand ...			5,380		76,653	51,758
Canada	202,171	115,434	141,303	312,321	345,795	323,968
Total	215,116	121,796	146,683	391,765	422,594	375,727
Foreign Countries—						
France	2,186	1,705	2,149	20,389	10,855	22,742
Holland	25,985	24,460	22,281	155,525	151,351	130,548
United States	65,875	41,737	30,349	394,772	274,860	257,847
Other Countries ..	7,512	6,576	6,561	28,551	40,293	31,265
Total	101,558	74,478	61,340	599,237	477,359	442,402
Grand Total	316,674	196,274	208,023	991,002	899,953	818,129

TABLE from the Board of Trade Returns showing the quantity of Cheese imported monthly into the United Kingdom from the Colonies and from Foreign Countries for the year 1902.

Cheese.

Date.	Colonies.				Foreign Countries.					Grand Total.
	Australia.	Canada.	New Zealand.	Total.	France.	Holland.	United States.	Other Countries.	Total.	
1902.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Jan. ...	...	32,907	7,336	40,243	4,803	19,927	65,972	3,864	94,566	134,809
Feb. ...	...	40,696	8,911	49,607	6,340	22,262	26,491	1,859	56,952	106,559
Mar. ...	1	41,147	7,502	48,650	3,699	18,848	53,995	4,191	80,733	129,383
April ...	...	15,368	13,327	28,695	3,165	23,374	48,662	6,942	82,143	110,838
May ...	..	52,507	9,302	61,809	2,586	23,856	32,378	7,848	66,708	128,517
June ...	...	141,303	5,380	146,683	2,149	22,281	30,349	6,561	61,340	208,023
Total..	1	323,698	51,758	375,727	22,742	130,548	257,847	31,265	442,402	818 129

TABLE showing Imports into the United Kingdom of Sheep and Lambs from New Zealand, Australia, and River Plate, for six months ending 30th June, 1898–1902



	New Zealand 1898	1899	1900	1901	1902	Australia 1898	1899	1900	1901	1902	River Plate 1898	1899	1900	1901	1902
Sheep	813 461	828 15[illegible]	894 856	882 234	942 949	664 021	579 190	327 907	706 776	154 760	1,232 824	1,140,222	1,177,263	1,251,862	1,327 205
Lambs	814 024	77[illegible] 361	782 669	779 100	1 190,161	47,331	154,996	277 641	360 791	490,854					103 353
Total	1,627,485	1 603,513	1 677 525	1,661,334	2,133,110	711,352	734,186	605,548	1,067,567	645,614	1,232,824	1,140,222	1,177,263	1,251,862	1,430,558

Importation of Fresh and Frozen Meats into the United Kingdom.

Mutton.

	June. 1902.	June. 1901.	Six months ending June. 1902.	Six months ending June. 1901.
	cwt.	cwt.	cwt.	cwt.
America	282	820	2,017	3,313
Canada	2	......	7	31
River Plate	118,582	80,562	673,887	609,493
Falkland Islands	......	......	......	......
New Zealand	250,239	165,098	899,466	798,964
New South Wales and Victoria	17,929	39,880	243,728	440,967
Queensland	......	11,560	102	13,277
North Russia	......	......	3	......
Holland	24,919	16,760	109,874	119,795
Germany	78	......	633	1,190
Other Places	129	166	1,233	1,697
Total cwt.	412,160	314,846	1,930,950	1,988,727

Beef.

	June. 1902.	June. 1901.	Six months ending June. 1902.	Six months ending June. 1901.
	cwt.	cwt.	cwt.	cwt.
America	199,270	313,930	1,234,435	1,648,403
Canada	7	1,396	40	5,951
River Plate	89,207	60,632	458,570	315,834
Falkland Islands	......	......	......	......
New Zealand	32,254	21,857	116,698	129,540
New South Wales and Victoria	634	3,075	711	10,449
Queensland	......	3,546	8,365	29,453
North Russia	......	......	87	65
Holland	1,764	71	29,859	1,907
Germany	96	224	948	1,206
Other Places	10,170	880	87,759	57,446
Total cwt.	333,402	405,611	1,937,472	2,200,254

Pork.

	June. 1902.	June. 1901.	Six months ending June. 1902.	Six months ending June. 1901.
	cwt.	cwt.	cwt.	cwt.
America	10,146	16,022	177,897	189,343
Canada	......	......	......	2,129
River Plate	......	......	158	207
Falkland Islands	......	......	......	......
New Zealand	......	42	151	1,363
New South Wales and Victoria	......	......	......	260
Queensland	......	......	......	......
North Russia	......	......	1,646	......
Holland	11,246	14,909	159,806	176,942
Germany	2	......	2	......
Other Places	451	442	16,610	39,657
Total cwt.	21,845	31,505	356,270	409,901

London Market Report, 11th July, 1902, says of Frozen Rabbits:—

The warm weather has tended to restrict the demand, and there are very few rabbits selling at the moment. Holders, however, are aware that it is useless pressing sales, and quotations therefore remain nominally unchanged.

The following are current prices on this market for reliable brands:—

New Zealand, selected, 3 lb. and up .... nom.	8d.	at	—	each.
,, large, 2½d. and up..........	7d.	,,	7½d.	,,
,, young, 2 to 2½ lb. ... . .about	6d.	,,	—	,,
Australian, large, 2½ lb. and up	7½d.	,,	8d.	,,
,, young, 2 to 2½ lb.	7d.	,,	—	,,
,, small, 1½ to 2 lb.	5d.	,,	—	,,

Wholesale Market quotations, Sydney, are:—

Wheat—4s. 11d. per bushel.

Flour—City roller, £10; Country, £9 15s. per ton.

Bran and Pollard—To 1s. 6d. per bushel.

Oats—Prime feed: New Zealand and Tasmanian, 3s. 7d.; Algerian, 3s. 7d. per bushel.

Maize—5s. 3d. per bushel.

Barley—Cape prime, to 4s. 3d.; English seed, to 4s. 3d. per bushel.

Peas—Scarce. Blue New Zealand, 8s.; Tasmanian, 7s. 6d.; grey, to 5s. 3d. per bushel.

Lucerne—Prime Hunter River, £7 per ton.

Chaff—Prime local, £6 15s.; Victorian, to £6 10s. per ton.

Oaten Hay—Prime local, to £8; Tasmanian and Victorian, to £6 10s. per ton.

Potatoes—Local seed potatoes: Early Rose, to £10 10s.; Brownell's, to £7 15s.

Onions—Italian, to £7 10s.; Victorian, to £7 10s. per ton.

Butter—Pasteurised, 1s. 4½d.; prime factory, 1s. 3½d. per lb.

Cheese—Local prime, loaf, to 9½d. per lb.

Bacon—Best factory sides, to 10d. per lb.

Ham, Colonial in cloth, to 10½d. per lb.

Eggs—11d. per dozen.

Poultry—Hens, to 3s. 9d.; roosters, to 4s. 9d.; English ducks, to 4s. 9d.; Muscovys, to 4s. 6d.; geese, to 6s.; turkeys, to 7s. 6d.; gobblers, to 16s. and 17s. per pair.

Hares—9s., 10s., to 15s.; rabbits, to 9s. per dozen pairs.

Oranges—Local prime, to 12s.; navel, to 8s. 6d. and 9s. for medium; prime, to 16s. per gin-case; Mandarins, prime, to 12s. per gin-case.

Lemons—Prime, 2s. per gin case.

Passion-fruit—Extra choice, to 14s. per case.

Loquats—Large prime, 6s. per half-case; good, to 6s. per gin-case.

Honey—Prime extracted, 3½d. per lb.

H. V. JACKSON,
Secretary, Board for Exports, Sydney.

AGRICULTURAL SOCIETIES' SHOWS, 1902.

Society.	Secretary.	Date.
Junee P., A., and I. Association	G. W. Scrivener..	Sept. 3, 4
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 3, 4
Young P. and A. Association	C. H. Ellerman...	,, 9, 10
Manildra P. and A. Association (Exhibition and Ploughing Matches)	G. W. Griffith ...	,, 10
Moama A. and P. Association	C. L. Blair ...	,, 10
Albury and Border P., A., and H. Association ...	W. J. Johnson ...	,, 10, 11
Yass P. and A. Society	W. Thomson ...	,, 11, 12
Berrigan A. and H. Society	G. Hamilton ...	,, 17
Germanton P., A., and H. Society	G. T. S. Wilson...	,, 17, 18
Burrowa P., A., and H. Association	John N. Clifton...	,, 18, 19
Temora A. and P. Society...	W. H. Tubman...	,, 23, 24
Wentworth P., A., and I. Society	Jas. W. Thorn ...	Oct. 21

1903.

Berry Agricultural Association	A. J. Colley .	Feb. 4, 5, 6, 7
Alstonville Agricultural Society	Frank H. Bartlett	,, 10, 11
Moruya A. and P. Society...	John Jeffery ...	,, 11, 12
Manning River (Taree) A. and H. Association ...	S. Whitbread ...	,, 11, 12
Ulladulla A. and H. Association (Milton)	C. A. Cork ...	,, 18, 19
Candelo Agricultural Association	C. H. Brooks ...	,, 25, 26
Bega Agricultural, Pastoral, and Horticultural Society.	J. Underhill ...	Mar. 4, 5
Crookwell A., P., and H. Society	C. T. Clifton ...	,, 5, 6
Berrima District A., H., and I. Society	J. Yeo	,, 5, 6, 7
Bombala Exhibition Society	R. M. Cook ...	,, 10, 11
Central New England P. and A. Assoc. (Glen Innes)...	Geo. A. Priest ...	,, 10, 11, 12
Goulburn A., P., and H. Society	J. J. Roberts ...	,, 12, 13, 14
Gundagai P., A., H., and I. Association	A. Elworthy ...	,, 18, 19
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The Limitations of Parasites in the Destruction of Scale Insects.

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THE question of destroying noxious insects by other means than the mechanical processes of spraying, fumigating, or poisoning, such as the introduction of parasitic insects that destroy the injurious ones, has been advocated for some years, and in a recent paper dealing with the predatory ladybird beetles, which are not parasitic in the true sense of the word, the writer brought together all the facts about the relative value of the different species that have been exported from Australia. In America, nearly all the States have one or more Experimental Stations, where independent investigations are carried out by economic entomologists, and as there has always been a considerable amount of rivalry, these questions have run to extremes, and so two parties have arisen. The Eastern Entomologists, including Dr. L. O. Howard, chief of the Entomological Division of the U.S. Department of Agriculture, and the majority of the trained men declare that while predatory and parasitic insects are most valuable as destroyers of noxious insects, they cannot, unless in exceptional cases, check their ravages, unless the farmer or orchardist also lends a hand.

The other school of entomologists, among which those from California are the most prominent, claim without any reservation that every noxious insect has a parasite that destroys it, and that if we can find the native country of any particular insect, we will there find the parasite that keeps it in check; these would stop all mechanical methods and leave everything to the introduced or native parasites.

The latter method certainly appeals to the orchardist who does not intend to do anything towards keeping down pests but lets his more energetic neighbours worry at those he breeds in his neglected orchard and which are sufficient to damage all the surrounding trees. He would sit on his fence and wait for the parasites to clean his trees, for if he was to interfere he would damage the insects working on his behalf.

There is just enough truth in this theory to make it plausible to the ordinary individual who has not gone further into the matter; so to commence, let us assume that every insect has its parasite, internal or otherwise. That parasite will also have its particular foe to keep up the balance of power that we know exists in all branches of the animal kingdom. In a wild country where man has not interfered with the surroundings, the struggle for existence works out its own end, and the hardy plant or animal best adapted to the situation survives. The

native insects will not totally destroy the indigenous trees of their habitat, for the demand and supply of food is closely regulated, and if the borderland is overstepped plants or animals affected vanish, and go to swell the lost creations that we find in the fossil remains of bygone ages; under such conditions pests would be unnoticed.

Everthing is changed, however, when man appears with axe and plough, clearing off the forest flora to make room for crops and trees, succulent and delicate in comparison with the original vegetation they replace, through long years of cultivation under artificial conditions. The supply of food is increased perhaps a thousandfold and insects that were restricted on account of a limited food supply also multiply in proportion. Such a case in point occurred when the eastern emigrants, pushing out west, planted potatoes in the home of the then unknown Colorado Beetle (afterwards only too well known as the "Potato Bug"). This beetle fed upon the wild sand burr (*Solanum rostratum*), a plant belonging to the same natural order of plants as the cultivated potato, so that when it found such a luxuriant growth of more suitable food, it deserted its old host plant, and multiplying in millions, spread through the potato fields of the whole of the United States, and is still one of their greatest pests.

If every insect's parasite was as effective under all conditions as is claimed by the one section, surely the "potato bug," with its soft-bodied larvæ, would have been kept in check by its natural enemies. But this is not the case, for at the present time the only successful remedy is spraying or dusting the foliage with Paris Green, and thousands of dollars are spent in the States on this one pest every year. This is an admirable illustration of the case where the parasite, if any, did not increase in proportion to its host.

Many other instances might be quoted to show how insect pests in their native land remain and become increasingly formidable enemies to the agriculturist, with the spread of cultivation. The Chinch Bug and the Hessian Fly, common in America, levy an incredible toll on the wheat fields of the States, and though the latter has a number of well known parasites, and the actual home of both pests is well known, they both have to be combated with mechanical methods, sowing catch crops, or the doubtful spreading of fungus germs. I cannot find that any of the most extreme advocates of internal parasites have claimed that these insects and others as serious can be controlled by their parasitic enemies, although we know they are more or less infested.

As it is with the farmer, so it is with the pastoralist; great armies of cut-worms, locusts, and other grass-destroying pests appear at intervals, sweeping over the country and doing an immense amount of damage; but some years we see nothing of them. Take our common locust; we know that it has a parasite upon its eggs, and half a dozen in the adult state, yet the first does not keep it from becoming a scourge, and the latter are of no actual value, as the locust has laid her eggs and eaten her fill before she is destroyed, and if she had not been killed would have died very soon afterwards in the natural course of events. If the squatter and farmer were to leave the work solely to natural enemies there would be little done. We know that the plague

locust of Southern Europe has been located in that part of the world for centuries, yet look at the countless millions of eggs unaffected by parasites that were paid for and destroyed by the British authorities after the occupation of the island of Cyprus; before that the parasites had had ample time to prove their powers, as the natives and their rulers, with their Turkish fatalism, were content to let them have a fair field without any interference.

We will now turn to the stronghold of the internal parasite and lady-bird beetle advocates—the orchard where we find different forms of trees gathered from all parts of the earth, that have in their native land been for hundreds of years cultivated and improved by artificial propagation and selection out of all recognition from the hardy wild forest stock from which they originally sprang; grown under (from a botanical point of view) an artificial system, pruned and cut back so that there is no waste wood grown, and the sap, nourished by manure, diverted into the flower buds to produce a fleshy covering of the embryo or seed, which in the wild fruit was simply a protective skin or attractive covering so that birds should devour and carry the seeds, or else to act as a food supply when the seed fell on to barren ground in the forest. If you let any cultivated tree run wild, if it is hardy enough to survive it soon ceases to bear fruit, or the edible portion becomes scanty and worthless.

Naturally, all such trees are very liable to damage from insect, fungous, and other special ailments; and as soon as the larger orchards became common, the trees did not receive the attention they naturally did in the early times when the extent of the orchard was limited (as in Japan at the present time, where every man has a few trees in his garden), and every spot and blemish was noticed and removed.

With the big orchards, and their thousands of trees, the different scale insects, aphis, and grubs innumerable (that had always existed to a limited extent), began to also increase, and as the interchange of new varieties of new fruit-trees from other countries began, insects that were previously unknown appeared in the orchards, until many of our worst pests are so world-wide in their distribution that their original home is a matter of conjecture. Spraying is quite a modern idea in the orchard, for it was not until about 1880 that the real spray-pump was thought about. All kinds of spraying devices had been used from the middle of the eighteenth century, but they consisted of whisks or brushes dipped into liquids, watering-cans, and garden-squirts or syringes. Lodeman says that Bordeaux mixture was first used by the vignerons of Southern France to sprinkle over the grapes growing along the roadside to keep travellers and children from stealing them, when it was noticed that these vines grew cleaner fruit; and subsequent experiments proved the value of copper salts in destroying fungous diseases.

It was soon found that where fruit was going to be grown for export, or in large quantities, something must be done to clear the trees of the many insect and fungous pests that disfigured the fruit or damaged the trees. Thirty years ago the conditions of fruit-growing were so

different that spraying was not a necessity, for many of the worst insect pests of to-day were isolated or unknown, and competition was not so keen, if markets were more limited. Probably not only had the isolated situation of many orchards, the shelter of the surrounding forest, and the virgin soil a great deal to do with the prolific crop, but the fact that the varieties grown were more hardy and adapted to the climate was another factor in the business.

Among the many insects that attack cultivated trees, with the exception of codlin moth, pear slug, and fruit fly, the most difficult to deal with are scale insects (*Coccidæ*) and plant-lice or aphis, and of those that cause the most damage are the following: Red scale (*Aspidiotus aurantii*), San José scale (*Aspidiotus perniciosus*) black or brown olive scale (*Lecanium oleæ*), white louse (*Chionaspis citri*), and mussel scale (*Mytilaspis pomorum*), none of which have been proved to be natives of Australia. None of the coccids peculiar to our bush have ever been recorded as pests on orchard trees, though some of our orchard scales, such as the brown scale, have spread into the bush; and quite a number of coccids introduced from abroad are also to be found on our native shrubs.

We have bred internal parasites from all these scale insects, chiefly minute wasps of the families *Chalcididæ* and *Proctrotrupidæ*, popularly known as Micro-hymenoptera, but others belonging to the Diptera or two-winged flies.

In a badly scale-infested tree one will—late in the season at anyrate, if he carefully examines a quantity of foliage,—find fully 25 per cent. at the very least of the adult scales dead and incapable of doing further harm, though still adhering to the leaves or skin of the fruit where parasites are present; about another 25 per cent. may be infested by them; but the young larvæ of the remaining 50, even with the many gaps in their ranks before they have managed to gain a foothold on the plant and constructed the horny scale to protect their helpless bodies, are quite sufficient to carry on the next generation and still further infest the tree.

At the present time all these scales have a very wide range over the world. Wherever oranges are grown red scale is found, with the exception of Florida, of which I have no record. No parasite has yet been discovered that has any appreciative effect upon this scale, while brown olive scale, one of the worst orange pests in California, and also abundant in Florida, is a serious pest in the citrus orchards of Australia and other parts of the world; yet it has numbers of parasites, both here and abroad. Howard has described about forty species of one family of Micro-hymenoptera that have been bred from lecanid scales. With regard to this scale, an important parasite has recently been introduced into the United States from South Africa by Lownsbury, where it is said to have almost checked *Lecanium oleæ*; but on examination it proved to be a well-known friend, having been originally described from Ceylon as a parasite on *Lecanium coffeæ* some forty years ago under the name of *Scutelliata cyanea*, afterwards recorded from Italy infesting a wax scale *Ceroplastes rusci*. Now, though there can be little doubt that this little wasp comes from the East, it has not

proved an efficient enemy to the native lecanid scales in Ceylon and India where *Lecanium viride* and *L. coffeæ* are very serious pests to the planters. San José scale, one of the most destructive pests in the world, has destroyed thousands of pounds worth of fruit-trees, and has had more laws and regulations against it than any known pest. Its exact home is unknown, but as far as we can find out, it probably came from America, as Marlott's researches last year tend to prove that it is not a native of its once-supposed home—Japan. It has certainly out-distanced any parasite it was troubled with in that country, and though widely distributed over this part of Australia does not do the same damage in some districts that it does in others, because it has a great number of parasites, chief of which is a small moth, whose larvæ form webs over the infested wood, and devour both big and little scales; but in spite of these parasites, hundreds of trees have died out in different parts of the State and the scale is still spreading.

Leaving all other groups of injurious insects out of the question except the scale insects, as they are the ones to which attention has been particularly called by the Californian experts, and going into the matter carefully, one will find, in spite of their multitudes, internal parasites cannot unaided clear badly infested trees of scale except in isolated cases; and the history of the spread and value of mechanical methods show that the bulk of the American orchardists place more reliance on spraying and fumigating than they do on their insect friends, though many of them recognise the value of these tiny workers as assistants.

In California alone there are a hundred tents at work to every one in New South Wales, and professional fumigators go round with a staff of men and regular outfits up to 150 tents. The State Entomologist, C. W. Woodworth, says: "The most injurious species at the present time is the black scale (*Lecanium oleæ*). In the South it is most troublesome on oranges and lemons, although it is also bad on olives and deciduous fruits. It is chiefly against this insect that fumigation with hydrocyanic acid is practised, but only as it occurs on citrus trees. On deciduous trees, resin and soap wash in winter is chiefly depended upon, but it is unsatisfactory on citrus trees. On these trees fumigation has come to be considered the only remedy. Red orange scale has given trouble only in the South and is also controlled by fumigation." The San José scale, he says, is well under control by regular spraying with lime, salt, and sulphur mixture. In Maryland, W. G. Johnson has found a parasite of the San José scale named *Aphelinus fuscipennis* that is greatly helping to keep the pest down; but he does not recommend that spraying should be discontinued: he simply advises that the trees be well pruned, the cuttings saved, and the trees well sprayed, and then the parasites in the scales upon the cuttings will emerge and destroy the remaining scales the spray may have missed.

Dr. L. O. Howard, after giving a list of the different scales common in the Eastern States, and the number of parasites bred from each—*Mytilaspis pomorum* 5, *Aspidiotus perniciosus* 4, *Lecanium persicæ* 6, and so on,—says: "The majority of parasites when affecting armoured

scales feed upon the eggs of the female late in the season, and earlier upon her body. The work of the later broods against the eggs is not complete. Thus we have found on examination of a large number of the scales of the oyster-shell bark louse in late winter and early spring, that from 2 to 18 eggs, under scales containing parasites, escaped destruction; the average number of eggs in uninfested scales being from 65 to 70. In two cases where the parasite had escaped late in the fall, 11 and 5 sound eggs respectively were found. In other scales from which the parasites had not yet issued, sound eggs were found as follows in each of 10 scales, respectively—2, 3, 4, 7, 10, 12, 11, 15, 17, 18. From these facts it is perfectly obvious that these parasites will not accomplish complete extermination."

In conclusion, the writer would point out that he is quite in unison with other economic entomologists who have carefully studied the question of the relative value of predatory or internal parasites from all points, in agreeing that while they do their part in acting as a check on the spread of the countless millions of injurious insects, and minimising the damage caused it is only under exceptional circumstances, and in isolated cases, that they have done more. Just as the noxious insects appear in immense numbers one year, and not in the following one, so is the supply of the parasites variable (even when known to exist); and naturally, though they might do very good work one year, the next will find them wanting. Climatic changes, natural and fungus diseases that attack the parasites as well as their food, and many other points have to be considered; their work, even at the best, is uneven. If, however, the orchardist is thus content to wait for the parasites to do all his work while he sits on the fence, he will not require any Vegetation Diseases Act, Inspection of Nurseries, Orchards or Codlin Moth Act, or other legislation to come to his aid; but, leaving insects out of the question, we know of nothing but chemical sprays that will stop the spread of the fungus spores of *Fusicladium*, shot-hole fungus, and others quite as injurious as insects. All spraying and fumigation will be stopped, and the orchardist left with the pests, parasites, and fungi, to work out his salvation.

If this state of affairs comes to pass, not only will the markets of the world be closed to our fruit-growers, but San José, red scale, and a host of others will continue to spread, and our once famed citrus orchards be things of the past.

I am quite confident that what the French expressively call the *laissez-faire* policy, which, rendered into forcible English, means the "let it slide" system, will not be tolerated by the progressive orchardists (daily increasing in numbers) who have to make a living out of their fruit, and are quite ready to spend a shilling upon a tree as a sound business investment if the yield in consequence of clean fruit will bring them in three shillings more than dirty.

These men will go on cleaning and cultivating their orchards, whether there are Vegetation Diseases Acts or not in force, making money out of them, not content to stick to old methods simply because they were their fathers; and, as in all other businesses, the race will be for the swift and strong.

State legislation in California, in spite of the advocates quoted, has the power that we do not possess in New South Wales to deal with insect and fungus pests: and fifteen other American States have the same.

The California 1897 Act gives the power as follows:—

A County Board of Horticulture.

"Whenever a petition signed by twenty-five orchardists of a county, and presented to the Board of Supervisors, asking that a Horticultural Commissioners' Board be appointed, is sent in, three members may be appointed within twenty days.

"(2) These Commissioners can cause an inspection to be made of stores, orchards, nurseries, packing sheds, &c., serve notices upon persons to clean their orchards, and if the orchard is deserted or the owner cannot be found, can file a notice in the County Recorder's office within thirty days, and within three months can sell the orchard to pay for the expense of eradicating the pests."

To Prevent Crows Pulling Maize.

In many districts the maize-grower has an anxious time from the moment his seed is sown until the young plants are about 4 inches high. If the seeds are well covered, and care is taken not to drop any odd grains anywhere on the surface, the seeding will in all probability be safe enough from birds; but bandicoots and other vermin may be excited to curiosity, and in their investigations root out and devour much of the grain. As a preventive of this, a dressing of Stockholm tar, or the water from a gasworks (a few quarts of the latter will do for two or three seasons), is often used with good effect. It is, however, when the shoots appear above ground that Mr. Crow gets to business, and how to check the losses thus incurred is a matter that has puzzled a good many people. One hears of all kinds of methods; one, from an American farmer who claims fifty years practical experience of it, and complete success, is worth considering. His plan is to scatter on the ground just at the time the crop is shooting through, a few quarts of maize grain, and continue to do this until the plants are ready for the first cultivation (*i.e.*, about 6 inches high). The experience of several American farmers on this point is to the effect that where the cultivated area is surrounded by forest, and crows and other birds are troublesome, the timely provision of some grain that they can pick up acts as a sure protection for the crop itself. The objection to the system is that the presence of the grain might create in otherwise unsuspecting bandicoots, bush rats, and birds a taste for grain that might make them enterprising in search of it in future. If something could be done to the grain to give the crows and other robbers a fatal dose, the others might get scared off.

The Effect on the Milling Quality and Nutritive Value of the Resulting Crop of Wheat when Bunt-infected Seed is Sown.

W. FARRER.

It is now known beyond possibility of doubt that the bunt-balls, which are too often found in the place of wheat grains in ears of wheat, are receptacles filled with the seeds which are produced by a parasitic plant growing inside the wheat plant which produces them. Nor is there, in the presence of a parasitic plant inside another plant, anything at variance with what we might reasonably expect to happen. Parasitic animals inside other animals are familiar objects. Worms of different kinds, for instance, and flukes are common in sheep; and analogy makes it to be reasonable for us not to be surprised to find plants similarly preyed on by other plants inside them. As we know that in the case of animals, internal parasites have an injurious effect, and weaken them and make them unthrifty, by appropriating food which the host-animal has prepared for its own nourishment, I thought it probable that a wheat-plant which is infested internally by a parasitic bunt-plant might, when, as is often the case, the bunt-plant does not produce spores (seeds),* have the nutritive value of its grain lessened. This would appear likely to happen from the bunt-plant having appropriated some of the contents of the sap, which the wheat-plant had prepared for the formation of its own seeds, and it would depend upon what the ingredients are, which the bunt-plant abstracts for its use, whether the nutritive value of the grain is lessened or its amount simply diminished. This is the point which the experiments I am about to describe were intended to throw light upon. These experiments were carried out in the following manner. Four varieties of wheat were chosen for them, viz., Jonathan, Lambrigg White Lammas, Power's Fife, and Minnesota Blue Stem. They were selected because they are all producers of flour of good strength, and because I expected to find that the deterioration, if there was any, of the quality of the grain would show itself in diminished flour strength, as well as in lower gluten-content. In this expectation it will be seen I was mistaken. The wheats were planted in drills in the following manner. One drill of each of these four varieties was planted with seed which was clean from bunt. In some cases, in order to make more certain that it was absolutely free from infection, the seed was soaked in a solution of formalin. On each side of this clean-seed drill, another was sown with seed taken from the same bulk, but so thoroughly

* I have learnt much connected with this fact, as well as about the manner in which the bunt-parasite infests the wheat-plant, from the researches of Professor H. L. Bolley, of the North Dakota Experiment Station.

infected as to be quite dark with spores. There was, therefore, a set of three drills of each variety—two planted with bunty seed, with a clean seed drill between them. In order to get uniformity in the conditions of the experiment, the same quantity of the same manure was drilled as evenly as possible into the soil midway between every two adjacent drills of plants and on both sides of the outside drills. The planting, also, of all the drills of each variety was done on the same day, although the date of planting was not the same for all the varieties. The weather and state of the soil at the time of planting were both favourable for germination, although, as it turned out, it would have been better, in the case of so late a variety as Minnesota Blue Stem especially, if the planting had been done earlier. From the time of planting until the middle of November, when the present drought began, the season was in every way favourable for the growth of wheat. At the time when the drought set in, Jonathan and Lambrigg White Lammas were well in flower, while Power's Fife and Minnesota Blue Stem did not come into bloom until about ten days afterwards. The result was that while the two former varieties produced a plump sample of grain, that of the two latter was pinched, as the column of weights per bushel in the table will show. During the growth of these wheats, one thing that I noticed was that there seemed to be more gaps from germination, misses in the drills which had been planted with infected seed. As this has struck me as having happened on more than one previous occasion, when bunt-infected seed has been sown beside clean seed, I hope to make this point the subject of more accurate observation. Nothing further in the way of difference between the drills of the same variety was noticed until the plants had reached their full height, when it could be seen by looking along the drills, that the height of the plants was much more regular in those which had been planted with clean seed. In those which were grown from infected seed there was much irregularity, and few of the plants in them appeared to reach the height of those in their respective clean-seed drills, although the final examination showed that in some of them the proportion of plants with bunty heads was relatively small. This observation has led me to think that, as might reasonably be expected, a bunt-plant, owing to its requirements of food, whether it produces spores or not, stunts the growth of the wheat-plant it infests, In some cases, and notably in those of Power's Fife and Minnesota Blue Stem, a few of the plants in the drills which had been planted with infected seed, seemed to reach the full height of those in the adjacent clean-seed drills. Such plants, I should imagine, had either escaped infection or had successfully resisted the entrance of the parasite. Whether the quality which enabled these plants to remain unaffected is one which they transmit to their progeny is a factor which closely concerns the effort I am engaged upon to make varieties which are so little liable to produce bunty heads as to be valuable on that account.

Some, however, who have given attention to this subject appear to think that the parasite enters all the plants which grow from infected seed and that those which grow with unimpaired vigour and produce

no bunt have only kept down the parasite, which still exists in them. This, so far as I have been able to learn, is a point which is still undetermined, and is one which might well engage the attention of a skilled microscopist.

TABLE OF RESULTS.

Variety.	Sample	Date of Sowing.	Weight per bushel in lbs.	Strength of Flour.	Gluten-Content.	No. of clean plants.	No. of bunty parts	% of clean plants.	% of break-flower.	Mill-products. Flour	Pollard	Bran.
Jonathan	A	July 1 '01	64	55	% 16·5				% 18·5	% 71 5	% 18·8	% 9·7
Jonathan .	B	1 '01	63¼	55·8	17 1	162	139	53 82	18·6	72·8	16 1	11·1
Jonathan	C	1 '01	63¼	55 8	17 4				17·0	70·7	14·9	14·4
Lambrigg White Lammas	A	4 '01	63	52	13·8				25·4	70 06	13.8	15.6
Lambrigg White Lammas	B	4 '01	62¾	51	14 9	66	245	21·22	22·4	73 8	10 1	16·1
Lambrigg White Lammas	C	4 '01	61¼	51	15 7				18 6	73·8	11 2	15 0
Power's Fife	A	5 '01	56	56·6	18 3				23 2	72·0	15·5	12·5
Power's Fife	B	5 '01	54½	56 5	17 8	311	55	84·97	22 2	68·0	16·4	15·6
Minnesota Blue Stem	A	1 '01	51½	53	15 9				25 4	69·5	14 1	16·4
Minnesota Blue Stem	B	1 '01	55	53·6	16·4	249	75	76·85	19 5	68·0	13·7	18·3

In this table the samples marked "A" consisted of grain which was produced by the clean-seed drills. Those marked "B" were from the drills which had been planted with infected seed, but were taken from the plants which had no bunt in any of their heads; while those marked "C" were from plants which produced some bunty heads, or had bunty grains in some of their heads. The sample "A" of each variety, therefore, represents a crop from clean seed and the sample "B" one grown under the same conditions from infected seed. The sample "B," however, is superior to that which a farmer would harvest from such a crop, in that the grain from all the undoubtedly bunt-infested plants was excluded; while the sample "C" represent grain which is inferior to such as a farmer would harvest from a bunty crop of the variety, because it contains no grain from plants which were free from the parasite. In the case of both Power's Fife and Minnesota Blue Stem there was not sufficient of "C" grain for an examination by the mill; and it would have been more satisfactory if I had simply mixed samples "B" and "C" of each of these two varieties and milled them together. We should then have had such a sample of each variety as a miller has to deal with when the grain is from a bunty crop.

An examination of the table brings out the following points:—(1) That the weight per bushel is greater from a crop which is grown from clean seed. This might have been expected, for when the crop is free from the parasite the sap is not called upon to pay tribute to it, with the result that the grain is better nourished and plumper than it is when it has been grown from infected seed. The farmer, therefore, who sows bunt-infected seed has lighter grain to sell; and, as grain

is sold by weight, he pays for the inferiority of his crop in this way. In the case of Minnesota Blue Stem it will be noticed that sample "A" was lighter than "B"; but the grain in these samples was so badly pinched that my screens were all too large to deal with them satisfactorily with the result that the two samples may have been differently screened. It looks, however as if some mistake may have been made in the weighing, as sample "A" resembled the corresponding samples of the other varieties in yielding more break-flour than did the samples from their respective bunty-grain drills. This circumstance affords reason for the opinion that sample "A" of this variety was in reality plumper than sample "B." It is unfortunate that enough grain was not left from the milling to make fresh determinations of the weights per bushel.

(2) The average flour-strengths of the four varieties tested were of samples "A" 54·15, and of samples "B" 51·25. Of the samples "A," "B," and "C" of the two varieties Jonathan and Lambrigg White Lammas, of which alone samples "C" were milled, the average flour-strengths were respectively 53·5, 53·4, 53·4. The average gluten contents of samples "A" and "B" of the four varieties were 16·1 % and 16·55 % and of the three samples "A," "B," and "C" of Jorathan and Lambrigg White Lammas 15·15%, 16%, and 16·55% respectively. These figures go to show that the grain which is produced by a bunty crop yields flour which is at least as nutritious as is that from a clean crop; and as the average yields of flour from samples "A" and "B" of the flour wheats experimented with were 70·9% and 70·4% respectively, and from samples "A," "B," and "C" of the two varieties which alone remained unaffected by the drought, 71·05%, 73·3%, and 72·25%, it can be seen that there was neither diminution of the quantity nor deterioration of the quality of the flour the bunty crops yielded. The conclusions which have been drawn from these experiments, apply of course to them alone. Before we can get data from which conclusions of general application can be drawn experiments like those which have been described will have to be carried out with many varieties of wheat and under a variety of conditions: but so far as they go, these experiments point to the conclusion that as far as its nutritive and milling qualities are concerned, grain from a bunty crop is as valuable to the miller as is that from a perfectly clean crop. The depreciation which comes from the presence of bunt-balls and bunt-spores being in it is another matter; but in view of the very perfect appliances for smutting which are now attached to flour-mills, it is unlikely to be serious.

N.B. The milling for these experiments—a very important and essential part of them—was done by Mr. G. W. Norris, of the Chemical Laboratory of the Department. I am greatly indebted to him for the care with which he did the work and for the interest he has taken in it.

Anthracoid, Septic, or Blood Poisoning Diseases of Sheep.

W. G. DOWLING.

EMINENT veterinarians describe these affections, and name them as above from their general similarity to anthrax, carbuncular, or charbonous affections, so named on account of the coal-black colour the blood and tissues assume under the disease. The septic ailments, in their primary state, are due to some peculiar form of blood degeneration. They appear under the influence of seasons, and are often limited to one pasture. The attacks are mostly simultaneous and sudden. The cause is traceable to the existence and influence of a septic or putrefactive poison, which, with food, water, or by inoculation, find entrance to the system, to the blood, and through that fluid to every part of the body.

Symptoms.

In such affections premonitory signs are usually absent, but the first symptoms noticeable in the cases that this paper is intended to notice, are metastatic lameness, and dark febrile blotches in the region of the shear-cuts, especially if the cuts be on the folds or wrinkles, and on the hock. When the latter are the seat of the trouble they assume large proportions, and are like black bands, and the gangrenous fluid exudes through the pores of the skin and at the lowest extremity, if in the leg the same feature goes down to the coronet, just at the hoof. The animal becomes prostrate, and eventually bloody mucous exudes from the nostril, and death ends the trouble. From a few hours to two days is the time it takes to run its course.

Treatment.

The treatment must be prompt and judicious when sheep are valuable; the poisonous fluid must be got rid of, and the quickest way, if the case is a very severe one, is to open the skin deeply and right along the afflicted part, so as to form a drainage, and dress the wound so made with antiseptics, the best of which is corrosive sublimate, which can be obtained in tabloids. One tabloid is dissolved in 4 oz. of water, or eight to a pint, or, in the absence of corrosive sublimate, permanganate of potash (Condy's Fluid), may be used with success. The wounds must be constantly dressed and disinfected until healthy action is set up, and the sheep kept in the sun as much as possible, as this aids the healing, and a drench of citrate of quinine and iron allays the fever. With ordinary flock sheep this method is too expensive, so the most practical way is to slaughter the first one noticed, and instantly burn the carcase, and remove all the others from the place of infection, and keep shifting them about constantly.

During the last few weeks there have been many losses from this cause in valuable stud sheep after being shorn, the point of inoculation being easily traceable to the shear cut. If the cut is on the side the black poisonous patch runs down to the belly, as I have before stated, and one noticeable feature is that the smallest cut or scratch is the one that gives the trouble. I attribute this to the fact that these small cuts are not dressed, and also that a dry skin forms rapidly over them, too rapidly for healthy healing; the deeper cut drains itself, and is usually well supplied with antiseptic dressing.

In years of drought like the present the blood must degenerate when the animals have to undergo hardships. Of course stud sheep are more liberally fed than flocks, but still nature denies them the necessary herbage to keep the blood in good order.

Preventive Measures.

Pastoralists, as a rule, do not study hygiene in regard to their stock as they should do. The woolshed, where this trouble that I am writing about occurs, is shut up and used as a receptable for skins and wool off putrid sheep until the shearing time comes round. It is then sluiced out with water (the floor only), the gratings are swept only, and the most valuable sheep (studs) are the first to be shorn in it, and the tar-pots (by this is meant the vessels that hold the dressing for shear cuts) are hardly ever cleansed, whereas they should either be burned out every year or fresh clean ones substituted.

It is far better to shear valuable sheep out in the sun on a tarpaulin, as the sun is a great antiseptic in itself, and then the shed can be opened up, the sunlight let in, well aired, and everything scrubbed with hot water and carbolic ready for the general shearing.

I am quite confident that if these hygienic rules that I have roughly laid down are recognised (and all shears well boiled before they are allowed to touch the sheep) that this periodic septicæmic ailment would be avoided, and heavy loss prevented.

A good few hundred pounds worth of stud sheep have been lost this year already, and the end is not yet.

Fifth State Butter Competition.

The Minister for Agriculture has approved of the State butter competition being continued this season. The competition will commence on 19th November, and entries must be made on or before 15th November. There will be three prizes—first, gold medal and certificate; second, silver medal and certificate; third, certificate of merit. Competitors will be expected to place, through their representatives in Sydney, one day each week, between 19th November and 17th December, twenty boxes of butter, from which will be selected two boxes. These will be removed to the Government cold stores, and judged a first time. They will then be placed in cold storage for six weeks, and judged a second time, after which the awards will be made.

A few facts and figures relative to the Fruit Industry in California.

W. J. ALLEN.

IN a recent edition of the *Fresno* (Cal.) *Morning Republican* some very interesting figures are given with reference to the fruit industry of that State, and as in New South Wales we have large areas of land suitable for the production of different kinds of fruits, it may, I presume, be of interest to those engaged or wishing to engage in this pursuit to learn something about what our neighbours across the ocean are doing.

In the year 1880, when I first went to California, there was but very little fruit finding its way to the eastern States, and not much, if any, being exported. The area planted to fruit-trees was infinitesimal as compared with what it now is, and still there are large areas being planted every year. So long ago as the year I mention, many were found who prophesied that the fruit industry was being overdone; and yet, notwithstanding the many obstacles which have had to be overcome, the people of California, have, through their energy and push, gone on from year to year increasing the area under fruit, and by exploiting other markets and placing a good article on the market have found sale for all their fruit at fairly remunerative prices. To attain this end, they have had to grow good fruit and to place it on the market in the most attractive style possible.

In the different counties of California there are 49,850 acres of apples, the largest area of this fruit planted in any one State being 11,585 acres in Santa Cruz. The total area of apricots planted is 34,938 acres, Santa Clara county leading with 7,268 acres. With cherries, there is a total of 5,251 acres, Santa Clara again leading in these also with 1,535 acres. With figs, there are 4,054 acres planted, Fresno county leading with 769 acres. With olives, there are 15,348 acres, Butte county leading with 1,373 acres. With peaches, there are 60,021 acres, Placer county leading with 11,441 acres. With pears, there are 17,058 acres, Solano county leading with 2,032 acres. With prunes, there are 81,838 acres planted, Santa Clara county leading with an area of 40,124 acres. Of this total area of prunes, 72,940 acres are of the French variety. With oranges, there are 52,030 acres planted, San Bernardino county leading with 13,500 acres, Riverside following next with 11,535 acres. These two counties adjoin one another, and nearly all the fruit is grown within a radius of 35 miles. With lemons, there are 13,429 acres planted, San Diego county leading with 5,500 acres. With almonds, there are 14,325 acres planted, Yolo county leading with 4,120 acres. With walnuts, there are 10,646 acres planted, Orange county leading with 3,505 acres. With grapes, there are planted 213,636 acres, Fresno county leading

with 75,755 acres. Of the total in the State, 107,908 acres are planted to wine grapes, 84,211 to raisin grapes, and 21,517 acres to table grapes. In all there is a grand total of 572,424 acres of nuts and fruits. In making up these figures it is assumed that there are 48 apple-trees to the acre, 75 apricots, 100 cherries, 48 figs, 75 olives, 100 peaches, 100 pears, 100 prunes, 100 oranges, 100 lemons, 100 almonds, 48 walnuts.

By glancing over these figures it will be seen that, as compared with California, we are still in our infancy. This State alone has about 50,000 acres planted to fruit-trees and vines. Still, with the conservation of water to enable us to irrigate, and by planting fruit-trees and vines more extensively in districts where they will thrive well without irrigation, there is a great future ahead of this industry here; but we must look to our export trade to find a market for our surplus fruits. As yet we are not growing sufficient fruit of any kind, except citrus, to supply our own State. When once the supply is greater than the demand, we will have to look to foreign markets to relieve us of our surplus; and we must push if we wish to secure this trade, and supply these foreign markets with fruit of the quality and put up in the size of package which finds favour with them. In other words, to build up our export trade we must supply the outside markets with the article which they require, whether it is the same or different to that which finds the most ready sale on our own market.

Pea-vine Ensilage.

A couple of American farmers, giving their experience in the *American Agriculturist* as to the use of pea-vine ensilage, state:—"We pay $2 per ton for pea-vine ensilage. We fed pea and corn ensilage half and half; about 10 lb. of each two feeds a day, morning and evening, making about 40 lb. a day. Some of my neighbours feed 40 lb. of pea ensilage a day with corn fodder or hay at noon. As to the relative value of pea ensilage, and bran and meal, we consider the former cheaper than the latter. It leaves our cows in better shape. When they are dry they are less feverish and constipated."—Weimer Brothers, Madison County, N.Y.

"I fed 20 lb. pea-vine ensilage at a feed, night and morning, with hay at noon. Pea-vine ensilage is cheaper at $2 per ton than meadow hay at $5 per ton for me to feed. I have fed 5 lb. at a feed to my team night and morning in place of grain, and they are as sleek as mules. To my colts I fed 3 to 4 lb. at a feed, with good hay and no grain. They have grown like weeds. For a mare in foal I think there is nothing like it. It keeps the digestion good."—R. G. Wright, Madison County, N.Y.

Effects of Discriminate Ringbarking, and the value of Kurrajong as a Fodder Tree.

W. MACDONALD,
C.P. Inspector, Quirindi.

RINGBARKING undoubtedly improves the grazing capabilities of ordinary forest land, especially if the operation is performed with proper discrimination; but, unfortunately, in the interests of the settlers generally, and of the State in particular, the indiscriminate use of the axe has done a great deal of mischief by an excessive destruction of timber, both of edible and non-edible varieties. Admitting the fact that forest trees absorb a great deal of moisture from the soil, that absorption does not prove so detrimental to the growth and quality of the grasses as the umbrageous development of the trees, which excludes the necessary sunlight, and prevents the growth of sweet vegetation. In improving forest land for grazing purposes, total destruction of the timber is not only unnecessary, but it is absolutely injurious in the interests of the grazier. Edible shrubs and trees are said to be exempted under the conditions attached to improvement and settlement leases, but with the exception of Kurrajong, Myall, and a few others, they are comparatively unknown to the ordinary grazier. Such as are known are frequently destroyed by being cut down stump-high, instead of being judiciously lopped of their upper branches, for most trees improve and the foliage becomes far more dense by lopping. The Myall apparently is an exception to the rule.

The varieties of edible trees and shrubs are so numerous that, at a time like the present, when protracted drought prevails and the ground is bare of grass, it is difficult to say what starving stock will not eat. In ringbarking, ample provision should be made for fire-belts, timber for building and other purposes, and choice groups of trees should be left on the tops and slopes of hills and ridges as camping places for stock. Timber should always be left along the banks of creeks and watercourses. Since it appears that White Box forms a large portion of the forests of the Namoi and Castlereagh waters within the boundaries of my district, and that on many holdings at the present time sheep are living upon the leaves of Box suckers in the ringbarked country, or upon the foliage of Box and other trees felled for them, I would suggest that White Box should be included in the category of exempted edible trees. There is generally a dense growth of suckers from the stump after sapping, and the saving of such suckers from about ten trees per acre, where available, should be a condition of ringbarking permits. Such suckers, instead of being destroyed, should be lopped or cut back with a brush hook, thereby preventing abnormal and encouraging

downward growths, and thus maintaining the necessary shelter, as well as fodder, to fall back upon in seasons of severe drought. The appalling disastrous drought, through which settlers are now struggling, affords us an object lesson worthy of attention, remarkably illustrative of the evil effects already produced by excessive and indiscriminate destruction of timber, and of what may be done in the future towards ameliorating such conditions. As to the question of replanting by settlers and others for the formation of shelter belts, I am of opinion that in this connection settlers should be encouraged to propagate the Kurrajong (*Sterculia diversifolia*). The remarkable qualities of this tree, and its value as fodder for stock, are too well known to need comment. Its deep subterranean roots give it the special quality of being drought-resistant, and it flourishes even at the present time, when other trees in the immediate vicinity are dying from want of moisture. It always improves by an ordinary lopping, and it therefore serves the threefold purpose of providing fodder, shelter, and ornament. Plants may be easily raised in any quantity from seed, which is cast from the matured tree periodically, and may be gathered in large quantities, either from under the tree, or by plucking the pods from the branches. Young seedlings may often be seen springing up under the shade of the parent tree, but, owing to the ravages of stock and marsupials, there can be no successful reproduction without protection. At the present time in the Gunnedah, Coonabarabran, Tamworth, and Murrurundi districts, Kurrajong is the salvation of many flocks and small herds. Unfortunately, owing to lack of reproduction, it is comparatively scarce, and may soon be a luxury of the past. As a crop it may be profitably cultivated, and it is somewhat surprising that so little has been done in this connection.

In an article by Mr. Guthrie in the *Agricultural Gazette*, under the heading of "Handfeeding Sheep," I observe a list and analysis of scrub plants, wherein the nutrient value of Kurrajong is given at only ·46 per cent., whereas other trees in the list, which we know to be of far less value as fodder trees, are quoted at a much higher percentage of nutrient value. To ordinary readers the analysis is misleading, inasmuch as the Kurrajong, proved to be one of our most valuable fodder trees, is quoted as a third or fourth-rate article. For illustration and example, I refer to the *Pastoralists' Review* of July 15th, 1902, vol. 12, page 320, to show what is now being done on Mr. A. A. Dangar's Mooki Springs Station, Liverpool Plains, under the able superintendence of Mr. H. C. Carter. On this estate Mr. Dangar says 12,000 sheep and lambs have been fed chiefly on Kurrajong since the middle of April from six paddocks, and in other paddocks on the estate there is enough to last these sheep twelve weeks. Apple tree, Box, and Box suckers are also being used, a few of these being lopped for the animals in the morning when they are hungry, and then they are treated to Kurrajong in the afternoon,—this they devour eagerly, gnawing the green tops down to the thickness of a man's little finger, even the young lambs chewing the leaves. There is no doubt as to the pre-eminent value and milk-producing properties of this tree during drought, as demonstrated at Mooki Springs, where one paddock

has tailed 82 per cent. of lambs,—thanks, as Mr. Dangar remarks, to the Kurrajong, aided by Liverpool salt and sulphate of iron given as a digestive, which the sheep and lambs also eagerly eat.

[The success with Kurrajong at Mooki was due to the use of digestive agents and a judicious change of diet. Had the Mooki sheep been forced to live entirely on Kurrajong, or on any other single diet, results would have been very different.—Ed.]

Export of Poultry, Rabbits, and Hares.

In connection with the export of poultry, rabbits, and hares through the Government Cold Storage Depôt at Pyrmont, the cash receipts during twelve months ended 30th June, 1902, amounted to £5,901 10s. 10d.; such receipts met the cost of all crates, rents, and salaries of officials and wages of labourers, thus practically meeting all expenses without charge to the State.

During the period 112,697 fowls, 20,953 ducks, 2,129 geese, 4,204 turkeys, or a total of 139,983 birds, were put through for export, of a value to the poultry-farmers of at least £16,000.

266,150 single rabbits were prepared for export of a local value of about £5,000. As scalp-money would not be paid, there would be a saving in that respect of £2,000 on such rabbits removed from the pasture lands of this State.

139,796 hares were prepared for export of a value of, say, £3,500, and in this case also scalp-money would not be paid, thus saving over £1,700 at the least.

During the twelve months under review, £53,800 worth of tinned meats have been examined and passed under Departmental certificate on account of the British War Office. New South Wales jam to the value of some £12,000 was shipped (after inspection and analysis) under the Departmental certificates; other produce, oaten hay, poultry, &c., brought the total of New South Wales products inspected and shipped under Government certificate to nearly £100,000.

The quality of meats and jams, &c., inspected at time of shipment by the Departmental officers was satisfactory, and no complaints have been received.

In the Early Days.

WALTER PREEDY.

HAVING recently had the opportunity of perusing, through the courtesy of Dr. John Hay, Patron of the Berry Agricultural Society, the First Anniversary Report of the original Agricultural Society of New South Wales, it has occurred to me that a few extracts from it may be of interest to the readers of the *Gazette*.

The report shows the broad aims which guided those who in July, 1822, founded the first society of the kind here, and affords those interested in the advancement of agriculture an idea of the means by which the pioneers of Australia overcame the vast difficulties connected with the development of the country.

The rosy forecasts of future prosperity, that their "fleeces would turn into gold, and the land flow with milk and honey" have been realised even beyond their anticipation. At that time the country was in its infancy - Hume and Howell had only just discovered the Murray and Murrumbidgee Rivers, and Oxley the Brisbane. Now, eighty years later, the trade of Australasia amounts to over £161,000,000.

Of the wool industry at that time the Hon. Barron Field, President of the Society, says in his address of 3rd July, 1823:—"Upon the subject so vitally important to the prosperity of the colony as the exportation of fine wool, I am truly happy to report that there went home from this settlement alone, during the past year, 726 bales of wool. At only 1s. 9d. per lb. clear profit, this will amount to £16,000 sterling."

Of the Society's work the report says:—"£30 has been remitted for the purchase of fruits, vegetables and flowers in England, and a letter addressed to the Navy Board requesting free room on the decks of vessels for our plant boxes. I anticipate great benefit to the colony from the importation of these choice fruits and vegetables. Fruits and vegetables are absolute necessaries of life in a climate like this, to which animal food is so uncongenial; and their perfection gratifies the most innocent and exquisite of all the luxuries of the table. The subscribers to our stock fund have remitted the sum of £1,000 to London to be expended one half thereof in Merino sheep, chiefly ewes; £300 thereof in horses; and £200 in horned cattle. Furthermore, £100 has been remitted by the hands of our Associate, Captain King, R.N., of Bathurst, to be laid out in grass and corn seeds and agricultural books.

"The next great step which I have to report to you is the earnest interest which our excellent Patron (Sir Thomas Brisbane) has been pleased to take in our prosperity, as manifested in his grant of an allotment of 4 acres on the north side of the Parramatta river, adjoining

the Government Domain, for a house of meeting and experimental garden, stable, and stock sheds.

"The Society have already presented to Mr. Jonas Bradley, of the Windsor-road, a silver tankard for 1 cwt. of negro-head tobacco of his own growing and curing. This was sent home as a specimen of colonial produce. Tobacco may be considered to be now fairly domesticated as a denizen of Australia. The Government Agricultural establishment at Emu Plains has greatly contributed to this desirable object. I understand from our Vice-Patron (F. Goulburn, Esq., Colonial Secretary) that New Zealand flax is to be made the next experiment of public cultivation.

"Our mother country has now completely weaned us. We have now to look out for the importation of free settlers and the exportation of fine wool. Nothing else will keep us in prosperity. But of ultimate prosperity let us in no wise despair. Should war in Europe diminish emigration it will raise the price of our wool, or perhaps open markets for our wheat and meat.

"We have had the pleasure of welcoming many most respectable free settlers in the course of the past year. But I hope we shall receive twenty times the number next year. I was happy in looking at the map of the Hunter River the other day to see the whole banks, and even some of the back land coloured with names. One of our most intelligent members, who has manufactured the best cheese yet seen in the colony, has removed his family to Bathurst, and other respectable settlers are following his example.

"We shall doubtless see many more free settlers in this country when the advantages which New South Wales possesses over Van Dieman's Land come to be more correctly known. We can have no ill will to that dependency. But it is important that emigrants from so vast a distance as Great Britain should not be ruined by disappointment. Of the superiority of New South Wales over Van Dieman's Land, I am decidedly convinced. But Van Dieman's Land has gotten the name at home, and it always takes many years to put down false pretensions and to make known true ones. Much of the stoppage short at Van Dieman's Land of Australian emigration is to be attributed to the wearisomeness of the past voyage, the expense of a visit to Hobart Town (it is so hospitable a place that it will not part with its guests), the fascination of a little cleared land; the beauty of the mountains which hem in and storm the town and line the country with places of refuge for robbers, and the interested persuasions of the master of the ship that the passenger had better go no further. I hope in a few years the eyes of the public in England will be opened to the superiority of this colony, in the first place in water, in the second in climate, for fine wool and fruits, in the unbounded extent of grazing land, in room for population for centuries."

Reference is then made to the premiums offered by the Society of Commerce, London, for "oil, the product of olives grown in New South Wales," and for "the finest wine, not less than 20 gallons, made from the produce of vineyards in New South Wales." The President says, "We have ventured to suggest that there being only one olive

tree in the colony, there can be no competition for the oil premium at present.

"Such, gentlemen, has been the progress of the Agricultural Society of New South Wales during its first infant year, and I hope it will not be thought unworthy of the spirit which gave rise to it. One of the leading purposes of Agricultural Societies is the cultivation of friendship and benevolence; and in a colony like this, where there are few natural ties to connect us, and where most of our relations and friends are far away, it appears to me that sociality is a peculiarly important object.

"But I trust that this Society will, by its numbers, its respectability, its talents, its unanimity and its moderation, attain every one of the ends for which it was instituted; that by the blessing of Providence it will increase our corn, wine and oil, make our land to flow with milk and honey, turn our fleeces into gold, and render us independent and happy in ourselves, a blessing to the hemisphere in which our lot is cast, and an honour to the parent country from which we sprang."

Such well-known names as Cox, McArthur, Berry, Piper, Oxley, Norton, Blaxland, Lowe, Throsby, Bell, Antill, Lawson, Rankin, etc., appear among the members of this first Society, the object of which was the advancement of our country in the early days.

Effect of Feed on Pigs and Pork.

A couple of years ago there appeared in the *Agricultural Gazette* the particulars of series of experiments conducted in Canada, Denmark, Germany, and England to determine the effects of different classes of foods upon the health and flesh of pigs. Since then the authorities of the Wisconsin Agricultural Experiment Station have been conducting tests with the same object, and the results practically confirm all the data arising from the other trials mentioned. All the experiments go to show that the most economical food for pigs as regards maintenance of constitutional vigour and thriftiness, rapid growth, quality and solidity of flesh, attractive proportions of lean to fat, is a well-balanced ration. As to what the different proportions of the food will consist of much will depend upon local circumstances, which may affect the cost of fodder; but so far as New South Wales conditions are concerned, the pig-farmer cannot go far wrong if he provides leguminous crops in the shape of lucerne or cow-peas and plenty of maize, to be consumed as green feed and as grain with a patch of rape as an occasional change. Cow-peas and maize sown together make a splendid fodder for pigs, but in harvesting such a crop for themselves the swine may waste a rather large proportion. In districts where the maize stalks can be allowed to stand after the ears are pulled, a good bit of pasturage for pigs can be provided by a seeding of rape or field-peas before the grain is removed, so that by the time the ears are all removed there will be something green and nutritious to help the pigs to digest the stiff cornstalks.

Irrigation in the Western Division.

J. WRIGHT, C.E.

We repeatedly read very glowing and without doubt very truthful descriptions of the wonderful changes that have been effected by irrigation in the arid desert valleys of the Western States of America, where millions of acres of the most sterile land have been transformed into the most fertile and productive known, at small cost, simply by the application of water alone, and the question is often asked : " Why cannot the same change be effected in the arid portions of Australia." The answer is not far to seek, and is comprised in few words. Want of water, and unfavourable surface conformation.

The physical features of the two countries differ very materially, both as regards water supply and surface conformation. The whole of the arid valleys of the Western States are intersected by many ever flowing rivers, fed by snow-clad mountains, with raised beds and low banks, having falls of from 3 to 6 feet per mile, the land on either side sloping away from the rivers with grades varying from 2 to 4 feet per mile, conditions most favourable for the economic diversion, distribution, and application of their waters for irrigation purposes. Whereas in the Western Division of this State there are no ever-flowing rivers with low banks or raised beds, nor are the slopes of the land at all favourable to the economic diversion, distribution, and application of water for irrigation purposes. Notwithstanding the disadvantages under which the Western Division labours, as compared to America, profitable irrigation is possible of accomplishment up to the limit or extent of the water supply that it is possible to provide.

The propounder of any irrigation scheme should—

(1) Endeavour to obtain the most abundant supply possible under the conditions of source of water, and funds at disposal ;

(2) He should study the character of the soils to be irrigated, the climate, and crops to produce ;

(3) He should possess a knowledge of wet agriculture, so as to at at least approximate the quantity of water required for various crops and how and when to apply it.

Water Supply.

This has been dealt with separately because of its importance, and it was concluded that the only possible means of securing a water supply was by impounding, on as great a scale as possible, by means of weirs, dams, and floodgates. Weirs in the rivers, floodgates at the confluences of the rivers, and blind watercourses and depressions, and

dams in the higher altitudes where greater facilities are afforded for the storage of large bodies of water than is possible on the plains. It appears that the proposal to construct weirs in the Darling might not be permissible because of their interference with navigation. As an alternative and means of increasing the storage of water, four, six, or eight locks, with 10 feet lifts, might be substituted for the proposed thirty locks of from 4 feet 6 inches to 6 feet 6 inches lift. This alternative merits consideration, either from a water storage or navigation point of view, because, if adopted, the navigation period would be extended, and the waters of a moderate flood or fresh in the river would be raised to such extent as would fill many if not all the depressions of the back country. The cost of a 10 feet lock would be, according to Messrs. Darley and Gordon, £20,000. As the fall of the Darling is only 3 inches per mile, a 10 feet lock would hold the water back to a distance of 40 miles, and, if constructed, they would be of great value as water impounding mediums, and the more water impounded means more irrigation and more fodder.

Character of the Soils.

The soils in the Western Division vary in consistence from loose sand to stiff tenacious black clay. All are more or less fertile and capable of producing crops in proportion to their fertility, by application of water; but each description of soil will demand different treatment.

The loose sandy flats and bases of many sand hills are the least fertile of the soils. Good crops of lucerne are, however, grown in such soils in Riverina without ploughing. The seed is sown broadcast and simply harrowed in. Anywhere such soils are easily cultivated and require little or no subsequent tillage, but for any crop they require heavy and frequent waterings in the growing season, for the reason that they consume more than double the quantity of water that other soils do for the production of a crop. They should only be cultivated when no other soils are available.

The red and brown sandy loams have in many places a depth of from 3 to 6 feet, and are easily cultivated and tilled; are in every respect superior in fertility to the sands, and having a loose subsoil are very suitable for the growth of deep-rooted plants. Lucerne as a first crop can be planted with the security of a good yield in any such soils, and they require less than half the quantity of water to produce a crop than the sands do.

The heavier reddish brown soils are of greater specific gravity than the loams; usually overlie a very compact and impermeable subsoil. In 1867 an analysis of these soils was made for the information of the Messrs. Desailly, of Mossgiel and Redbank, by Dr. Macadam, of Melbourne, who declared that they were rich in all the chemical constituents necessary for the production of grain or corn, and were perhaps suitable for the growth of any plant without aid.

This description of soil is at first most suitable for cereals, and if intended for lucerne should grow at least one or two crops of cereals

before lucerne is planted, so that the subsoil may become so saturated as to permit the lucerne roots to penetrate without effort. Under wet cultivation this soil requires lighter but more frequent applications of water than the loams.

The stiff and tenacious black soils possess great fertility, but are the most difficult to cultivate because of their tenacity and habit of caking. Several of these soils were also analysed by Dr. Macadam, and, with the exception of those taken from the lignum swamps, he stated they were very good indeed and advised Indian corn as the most suitable plant to be grown in them, though they would also be suited for cereals. Their propensity to cake renders them difficult to treat by wet cultivation; the caking of course increases the evaporation and makes the tillage very laborious and troublesome. By cropping such soils with cereals for one or two seasons, or with Indian corn on the ridge and furrow system, they would then be in a condition suitable for the growth of lucerne.

Crops to be produced.

Lucerne is undoubtedly the ideal crop for the pastoralist or stock raiser. Its yield is much greater than that of any other known fodder plant, ranging from 4 to 10 tons per acre, and all kinds of stock will consume it readily and thrive.

It is easily and economically cultivated as compared with other crops, because, once planted and established, no replanting is necessary for from ten to fifteen years. Its harvesting extends over three or four periods, hence no excess of labour is required for that purpose, as is the case in harvesting cereals. As a fodder it is equally valuable fed green a day or two after cutting, or dry as hay. The ridge and furrow system of planting lucerne produces the best results in both American and French experience. The drills are spaced from 10 to 12 inches apart, the furrow for the water being run between them. It is estimated that this system produces from 15 to 20 per cent. more lucerne than where sown broadcast, and requires 20 per cent. less water, it also renders winter tillage easy. Feeding off lucerne is very wasteful, especially for sheep, as they nip off the tender shoots and in doing so often injure the main stem, thus retarding growth. The best results are obtained by feeding it in a green state one or two days after cutting, or dry in the hay form. It is not wise to plant lucerne in strong virgin soils with stiff subsoil, because it is very apt to exhaust itself by over or forced growth and the exertion of the roots to penetrate the subsoil. It is much wiser to raise one or two crops of cereals from rich virgin soils before planting lucerne. For the reason that lucerne in proportion to its yield of fodder requires the least water, the object of all irrigation in the Western Division should be the cultivation of that plant. Under some conditions and situations Indian corn for ensilage might be grown with profit, or cereals for hay, but being annuals neither will be so valuable as lucerne, or as economical to grow.

Quantity of Water required for various Crops.

Notwithstanding the fact that irrigation has been practised from the earliest times to the present day, no records have been kept of the quantity of water required to produce any particular crop. The Secretary of the Agricultural Department of the United States of America in his 1900 report, says, in reference to this very important matter, "An approximate knowledge of the quantity of water required to irrigate an acre of land growing any given crop is sooner or later a necessity in any irrigated district. Farmers, engineers, commissioners, and legislators all need this information. Without it all important irrigation transactions are and must be based on conjecture." Taking a flow of 1 cubic foot per second, the duty of which varies in different countries so greatly for the same crop that it is absolutely impossible to fix a minimum—for the growth of cereals in India and Granada, Spain, 1 cubic foot per second irrigates 200 to 250 acres; in California, the same supply will irrigate 500 acres, and at Lorca, Spain, 900 acres. In the face of such extremes it is impossible to say what is the duty of any unit of water; nor does the value of a unit of water help in any way. At Loca, Spain, the value of 1 ton of water is $\frac{6}{10}$ of a penny, in Lombardy only $\frac{1}{240}$ of a penny.

In Southern France it is estimated that from 10 to 12 inches of water will produce an ample crop of lucerne. In Southern California and Western New Mexico from 5 to 6 inches only is sufficient for lucerne. Flood irrigation is the most wasteful of any, but being the easiest and cheapest manner of applying the water has been the most practised—especially for cereals and lucerne. Of late years owing to the scarcity of water by the increase of area irrigated, economy in its use became a necessity in many irrigation districts, and it has been found possible to produce even cereals with from 40% to 60% less water under or by the ridge and furrow system than by flooding. Flood irrigation for lucerne is not only wasteful of water, but it also injures the lower leaves of the plant which are wetted, and the action of the sun causes them to wilt and wither. It is estimated by growers that the ridge and furrow system increases the yield by at least 20%.

How to apply the Water.

The general slope or grade of the land in the Western Division is from 4 inches to 18 inches per mile—that is, towards the water courses and rivers and in the direction of their flow. Such low gradients are most unfavourable to economic irrigation, because they increase the difficulty and cost of applying the water. To apply the water by gravitation wherever low grades obtain, canals of great length must be excavated at considerable cost—certainly at a cost too great for a limited supply such as at first it will be possible to provide for the land being dealt with. Wherever the supply is limited, the irrigable area must be dependent on the supply for its extent, and where application of water by gravitation is not possible pumping must be resorted to. The opinion that pumping will be too expensive prevails

with many pastoralists; experience in other countries shows that it is not so. For instance in Fresno, Arizona, Dakota, and San Joaquin pumping costs the farmer less per acre than he would have to pay the supply companies. With lifts up to 15 feet, windmills are the most economical. Hot air and oil engines pump sufficient water to irrigate 40 acres at a cost of about 9s. per acre per annum, the initial cost of the engines and 2½ inch pump being from £80 to £100. The lifts in the West will all be low, from 3 to 15 feet, so it is anticipated wind mills will be largely used for raising the water to the surface.

The most approved method of applying the water is to run a couple of plough furrows along the higher side of the section of land to be irrigated, as nearly level as possible, into which the water is run or pumped—usually called the lateral head drain. When this drain is filled, small notches or channels are cut with spade or hoe, and the water then runs into the distributing furrows. Owing to the low surface slope, the sections of irrigation must not be more than 300 or 400 feet in length, because of the liability of the upper portion of the section to be super-saturated. With low grades any where more lateral head drains are necessary than where there is a good fall, but if they involve a little more labour they economise water and prevent over-watering in the upper portions. This method is also adopted for the growth of Indian corn and sugar cane in many parts of America. Sub-irrigation by means of pipes is being practised largely in the fruit growing districts of America, but is too expensive to be applied for the growth of fodder plants.

When to apply the Water.

This question—on a recent visit to Mildura and Renmark—was put to several residents. The reply was " Whenever we think our trees, vines or other plants require it. They soon let you know when they want a drink." The Americans say the proper "when" can only be ascertained by experience and study of the soil, plant, and climate.

The profitable occupation of the Western Division is only possible by the provision of water and fodder, and as fodder cannot be produced without water the provision of that element demands primary attention; and although it will necessitate the expenditure of large sums for storage reservoirs and other works, the benefits that are certain to result will more than justify their construction.

The enormous addition to the wealth of individual States and to the commercial prosperity of the whole country which has been the direct results of the high culture produced by irrigation in America, warrants our incurring almost any expenditure to bring about similar results. The Western lands are most fertile and capable of producing any crop by the application of water, and the provision of that element is all that is needed for its development and future prosperity.

The Effect of Overstocking our Dairy Lands.

M. A. O'CALLAGHAN.

In a country like this, where there is no rotation of crops carried on by dairy farmers, the effect of overstocking, and thus preventing the best grasses from ever going to seed, cannot but have an injurious result. The most nutritious grasses are those that are first eaten up by the stock, and hence these get the least opportunity of reproducing themselves by means of seed. In time these best grasses become eaten out, and inferior kinds, which were rejected by the cattle and allowed to seed, will have taken their place. This means a constant deterioration of pasture. If pastures were not so heavily stocked, and if paddocks were spelled occasionally for three or four weeks, these best grasses would have an opportunity of reviving, stooling out and seeding, and thus preserving their continuity in the pasture. In countries where a considerable amount of meadow hay is cut, there is a distinct advantage in this way. On the richest pasture lands in the western district of Victoria a certain amount of meadow hay is cut yearly; and though this in itself is not sufficient for a winter food for milch cows, it still forms a very useful portion of a food ration, and enables the pasture to be maintained in good condition. Overstocking has another very serious disadvantage, namely, its effect on the amount of moisture retained by the soil. This country suffers much more from want of rain than from too much rain, and anything which will preserve for the soil a greater amount of moisture is of an advantage. When pastures are eaten bare through overstocking, the rain runs off the surface of the fields or paddocks with ease, whereas if the soil was covered with 3 or 4 inches of pasture the rain-water, instead of running off, would be retarded in its progress of escape, and would be absorbed by the soil in much greater quantities.

Side by side with overstocking comes the question of the depreciation of our pasture lands by continually drawing on them for nutritive substances without returning anything in the shape of manure. It should be borne in mind that before many of our pasture lands were used for dairying, especially along the South Coast, they were used for wheat-growing; and hence, when they were laid down to grass, they could not be looked on by any means as virgin soils.

As a consequence of continued stocking without the application of manure, these lands have deteriorated in value, and the time has come for our farmers to seriously consider the question of doing something to aid nature in making these lands again fertile. This may be done by a mixed system of farming, or by the growth of crops requiring good tillage and plenty of manure. It would be impossible for farmers to rent land from many land-owners in England to be farmed on the condition in which dairy-farming is now carried on in many

of our districts, simply because it means a gradual impoverishing of the soil. Another method by which these grass lands might be considerably improved is that of top-dressing with suitable manures. This is perhaps the cheapest method to adopt to restore fertility to these soils. If the housing of cattle were a common practice in this country, sufficient farm-yard manure would be obtained for enriching the soil either by means of cropping and manuring or by top-dressing; but as housing is not a necessity except in the colder portions of this State, our dairy-farmers make very little farm-yard manure, the result being that unless manure is purchased for top-dressing—a by no means common practice—the soil is allowed to be constantly depleted of its nutritious matter, and its carrying power is lessened. An American farmer, writing on this question, says:—"Our method is to put all the manure on the maize ground, which is used for ensilage-making; and when the maize is removed we sow with rye in the autumn, or oats and barley in the spring, and seed with clover and Timothy grass. The next year we graze it; the fourth year it is mown, after which it is again prepared for maize; and I believe that our land is increasing in fertility by following this course." Some such system of rotation and manuring ought to be feasible enough throughout a good deal of the dairy country of this State, and the matter is only touched lightly on here; but it is hoped that this will be sufficient to arouse some enthusiasm on behalf of our farmers to improve the conditions of the pasture lands.

As a standby and to enable farmers to spell their pasture paddocks nothing equals lucerne, and it is a pity our dairy farmers do not make greater efforts to grow it in districts possessing such suitable soils.

The New York Agricultural Experiment Station carried out in 1894 extensive experiments with regard to the feeding of milch cows with lucerne, compared with other foods, and the following general observations were made on the results:—"When lucerne was substituted for some other food, or when the amount of the lucerne in the ration was increased, there followed in ten experiments a decrease in the cost of the milk, and in two experiments a very slight increase, while in two other instances the cost of the milk remained practically the same. There was an increase of the milk in seven instances, a decrease in four instances of about what might normally be expected to occur without change of food, and little change in yield in three instances. When the change was from a ration containing lucerne to one containing less or no lucerne, there followed an increase in the cost of milk in ten instances, and there was about the same cost once. There was a decrease of the milk yield in nine instances, and an increase in two.

"When lucerne was substituted for other foods in the ration, or when the amount of lucerne was increased, there followed a decrease in the cost of fat in seven instances, and an increase of the cost in six instances. There was an increase of the amount of fat in six instances, a decrease in five instances, and little change in amount twice.

"When the change was from a ration containing lucerne to one containing less or none, there followed an increase in the cost of fat in

nine instances, a decrease in cost once, and there was about the same cost twice. There was an increase of the amount of fat in three instances, a decrease in three, and about the same amount of fat in five.

"When the change in the ration was to more lucerne, or to lucerne in place of some other food, there followed a decrease in per cent. of fat in milk in six instances, an increase in three, and little change in per cent. in four instances. When changed from a ration containing lucerne to one containing less or none, there followed an increase in per cent. of fat in six instances, and a decrease of per cent. in five.

"There has been usually an increase in milk yield accompanying the use of lucerne, although there was often at the same time a decrease in the per cent. of fat. With lucerne forage rated at the same cost as other forage, there was generally a decrease in the cost of milk when the lucerne was fed, and not much change in the cost of the fat produced.

"Maize forage (fully matured) in the results accompanying its use has compared most favourably with lucerne; but except in the form of silage it is only available for a short time in the fall before frost. Lucerne is ready for the first cutting about the time for planting the corn, and about as early as rye forage can be cut. The proportions of constituents also differ so widely between lucerne and corn forage that these plants cannot well be considered as substitutes for each other, but as supplementary. For making rations like those usually fed, coarse fodder and grain foods, in general cheaper than those used with corn forage, can be fed with lucerne. The more highly nitrogenous grains and hays fed with corn forage or silage, however, have a much higher manurial value, which fact is often of wide importance.

"The palatability of lucerne or of corn (maize) is greater than of most other forage plants of rapid growth that will yield heavy crops. This is a matter of the greatest importance, for while the milk may temporarily be produced at the expense of loss in weight of the animal, the flow of milk must be sustained by the food taken in excess of that necessary for maintenance."

Cape Weed.

Cape weed is showing up strongly in many pastures just now. When partaken of to some extent by milch cows, it imparts a pungent aftertaste to butter.

Farmers would act wisely in checking the spread of this weed.

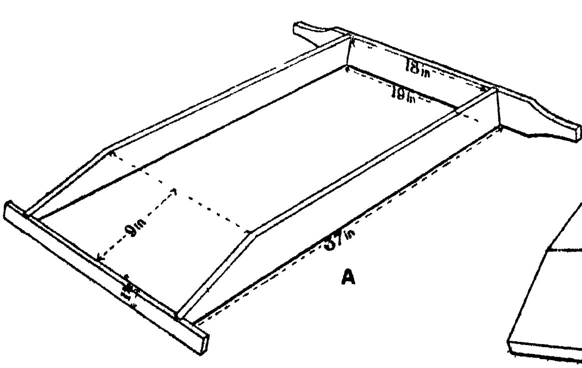
Concrete Floors for Beehives.

ALBERT GALE.

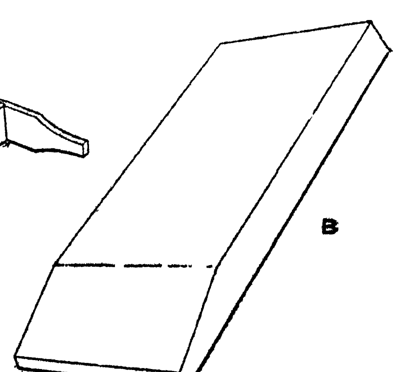
THESE are a combination, forming at once both a hive-bottom and a hive-stand. Among bee-men, they have called forth a good deal of comment, oral and written. Some of these comments are adverse, and others complimentary. The objections are:—they are too expensive, too heavy, and too hot. Too expensive! A cask of cement costing 14s. in Sydney will make fifteen of them; that is as cheap as wood, nay cheaper, because they are everlasting. Too heavy! This will depend on the gumption of the maker; if he places the mould on the site where the hive is to stand he will have no occasion to remove it, and the weightiest object to handle will be the mould. Too hot! They were used at the College all last summer, and were not found so. If this objector had seen them in use he would have said otherwise.

Their advantages: Being made on the surface of the ground, there is no harbour for bee vermin, such as spiders, earwigs, &c. An eight-frame hive covers a superficial area of 280 inches, and that of the concrete floor, about 700 inches; being considerably more than twice the area of a hive, it thus prevents weeds, &c., overgrowing the hives, and gives free access for the bees at all times. They are fireproof. Of late many a hive of bees would have been saved if these concrete floors had been used; wooden ones soon take fire. They are much cleaner than wood; are not affected by conditions of weather, therefore they do not shrink, crack, or warp. They never require painting, and will remain serviceable for generations, improving with age. Can this be said of wood? The bee entrance can be contracted to nil or expanded to 2½ in. x 9 in., so that the bees can fly directly in among the combs if it be so desired. The entrance has a fall of 2½ inches in 9 inches, so no rain can beat therein.

The diagrams are lettered from "A" to "E.' is the frame in which "B" was moulded. The bevel of it is 9 in. x 18 in. It gives

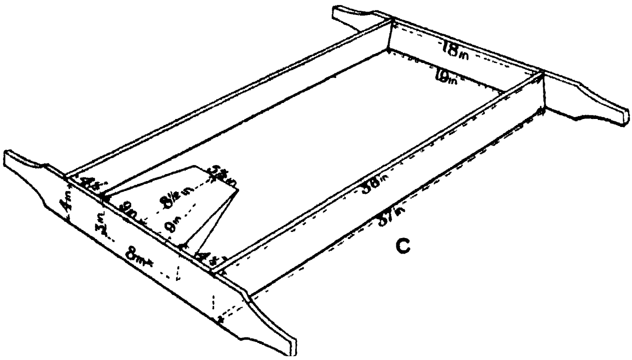


A

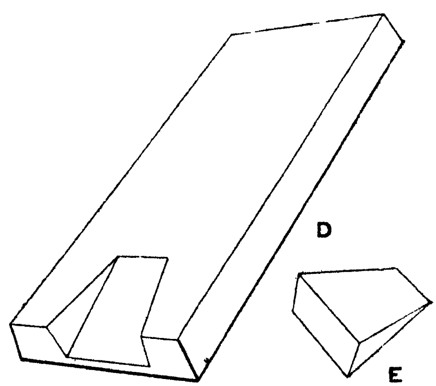


B

a full width entrance to an eight-frame or a ten-frame hive, and the first concrete floors used at the Hawkesbury Agricultural College were of this type. "C" is the frame in which "D" was moulded.



It will be noted that the difference between "B" and "D" is that the latter has a $1\frac{1}{2}$ inch shoulder on either side. This, when the hive is brought full forward, gives it a more solid foundation to stand on, and at the same time gives protection from cold currents of ari sweeping underneath the hive. "E" is the tongue that forms the entrance.



In modelling these floors proceed thus: Select the site, place the moulding frame thereon, first ramming the soil firmly down; try the *frame* with a spirit level; when true, fill in about 1 inch in thickness the full *width* of the frame, and about 10 inches on the end where the shoulders of the floor are, with two of sand and one of cement. Insert the tongue, as shown in "C," then fill in the remaining portion of the frame with concrete, level with the top of the frame. Leave all to stand for twenty-four hours or more. Take out the tongue ("E"), lift the frame ("C") by the handles, as shown. The block will appear very rough, but finish it off with a thin coating of a mixture of two of clean sand and one of cement. The more cement is used in this final coating the more impervious to damp will the block be. Put this final coating on with a trowel. When the whole block is coated, if it be rubbed over with a piece of old bagging made very wet, there will be a very good smooth surface.

The concrete can be formed with gravel, sand, and cement, one part of the latter to two of the former; or fill in the frame with broken bricks, stones, &c., and pour in the mixture of sand and cement until the frame is full, when the whole mass may be gently rammed together.

Commonsense Orchard Management.

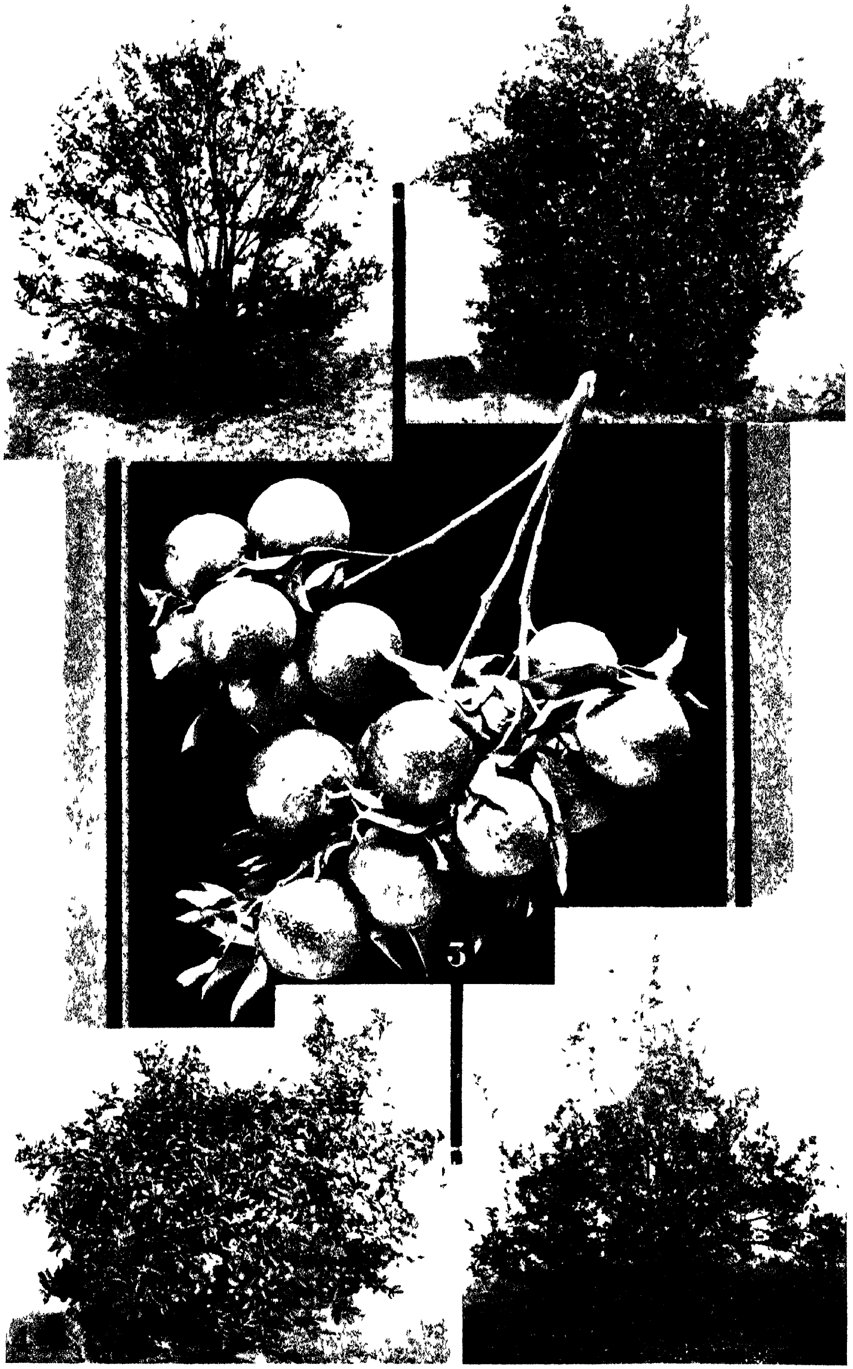
W. H. CLARKE.

In a paper which appeared in last month's issue of the *Agricultural Gazette* Mr. Moore makes reference to the excellent condition in which he found the Hawkesbury College orchard during this last dry season. Having taken the trouble to go there and see for himself how shortage of rainfall and lack of facilities for irrigation can be counterbalanced by the adoption of systematic methods of culture, Mr. Moore urges fruit-growers generally to take advantage of such methods. To show that what is practised at the Departmental Orchards under the supervision of Mr. W. J. Allen can be and is undertaken on a purely commercial scale—as well as, in some particulars, a more elaborate scale—in private orchards, the property of one of the new school of fruit-growers, who endeavour to keep up to date, can be taken as an example. As the proof of the pudding is in the eating thereof, so the success of orchard management is in the market returns. The writer does not feel at liberty to ask Mr. Hugh Turner, the owner of the Glenorie orchard in question, what his returns for the current season are, but feels safe in saying that plenty of his six-year old trees returned as much per tree as numerous parched orchards returned per row the same season.

Mr. Turner's trees are mostly citrus, but there are a few summer fruits and passion vines. The good returns that come as the reward of sound management permit of the employment of good horses and implements. In working the orchard there is one annual winter ploughing to a depth of about 5 or 6 inches and very frequent cultivation throughout spring and summer with a disc harrow. Mr. Turner especially emphasises the necessity for careful shallow ploughing of the strips close to the trees. In deep soils this precaution would be quite unnecessary, as by the time the trees had reached bearing age there would be within a foot or 18 inches of the surface no roots that even the most careless ploughman could mangle, but in the great majority of our orchard lands the subsoil is of such a character that the whole of the roots of fruit-trees—especially citrus trees—have perforce to live within a few inches of the surface, and every time a plough scrapes through masses of them the tree sustains a set-back. In some of the older hand-worked citrus orchards that are still models of profitable fruit culture, the destruction of a few roothairs by a careless sweep of the hoe is always looked upon as a heinous crime.

But no matter how carefully the tillage of an orchard may be performed, it is labour in vain if the drainage also is not good. The advantages of effective drainage are many—some perfectly obvious; others more difficult to realise at first. To take the main benefits:—

1. To prevent the accumulation of stagnant water in the soil.



1 Neglected Mandarin tree 2. Mandarin tree fumigated last winter 3 Oranges from fumigated tree There were fourteen oranges in this bunch, averaging about 3 inches diameter 4 Lemon-tree pruned 5 Lemon-tree unpruned

2. To mellow the soil, facilitate working, and increase, as regards depth, the foraging field of the roots.
3. To enable the soil to retain moisture in dry weather.

These are just common facts, but unfortunately for themselves lots of orchardists either cannot realise the importance of them, or seem to think that the expense is beyond their means. It is a downright pity that people who find it hard to regard an undertaking of any sort with favour, or who make up their minds beforehand that something is impossible, cannot—for pocket reasons if for no other—see their way to try some of the things in a small way. For instance, taking No. 1 of the advantages claimed for drainage. Suppose we take one strip of that putty-like soil between that row of trees which never seem to have made a fair start—that are stunted and perpetually scaley and altogether unsatisfactory. That will be a piece of land say 20 feet wide and perhaps several chains long. It is surely not a Herculean task to cut a drain say 30 inches deep and grade it carefully to an outlet, or if that cannot be conveniently managed, to a hole about a foot deeper than the lower end of the drain. The effects of good drainage will within twelve months be noticeable in the ease with which the soil can be ploughed, forked, or dug: it will no longer cling to the mouldboard or clog the hoe. Instead of sticky lumps which will form hard clods, the plough will leave, at about half the draft, a well pulverised soil-mass, and thus render it possible to dispense with the big horse of limited usefulness and go in for an active lighter one that will be for orchard requirements of infinitely greater service. Where the horse would get bogged in sodden, undrained soil, the removal of surplus water will leave the ground in a spongy condition which will, almost as soon as the rain ceases, bear the weight of a team without the puddling and fearful mess that is to be seen in some orchards. In dry weather too, drained soil can be relied upon not to "set," and on that account it can be comfortably ploughed at a season when the plough will only skid on unploughed land or turn up lumps that one cannot smash with a stone hammer. The gain in time saved and ability to put in a green crop or perform any other desired operation at the best time, and irrespective of the weather, will prove incalculable. Moreover, when an attempt is made to conserve soil-moisture in undrained land, the delay that must take place before the ground is firm enough to carry the horse, and friable enough to break up into a sufficiently fine earth-mulch, also permits of the escape of a great part of the moisture, because evaporation is going on from the moment the rain ceases, and the longer the surface remains compacted the greater the evaporation. Soil saturated with water occupies a relatively larger space than dry soil, and when the ground cracks, it shows that moisture, roughly speaking, up to the extent of the fissures has been entirely lost to the crop. That is why careful orchardists are so anxious to get on to the land after rain to stir the surface with a cultivator.

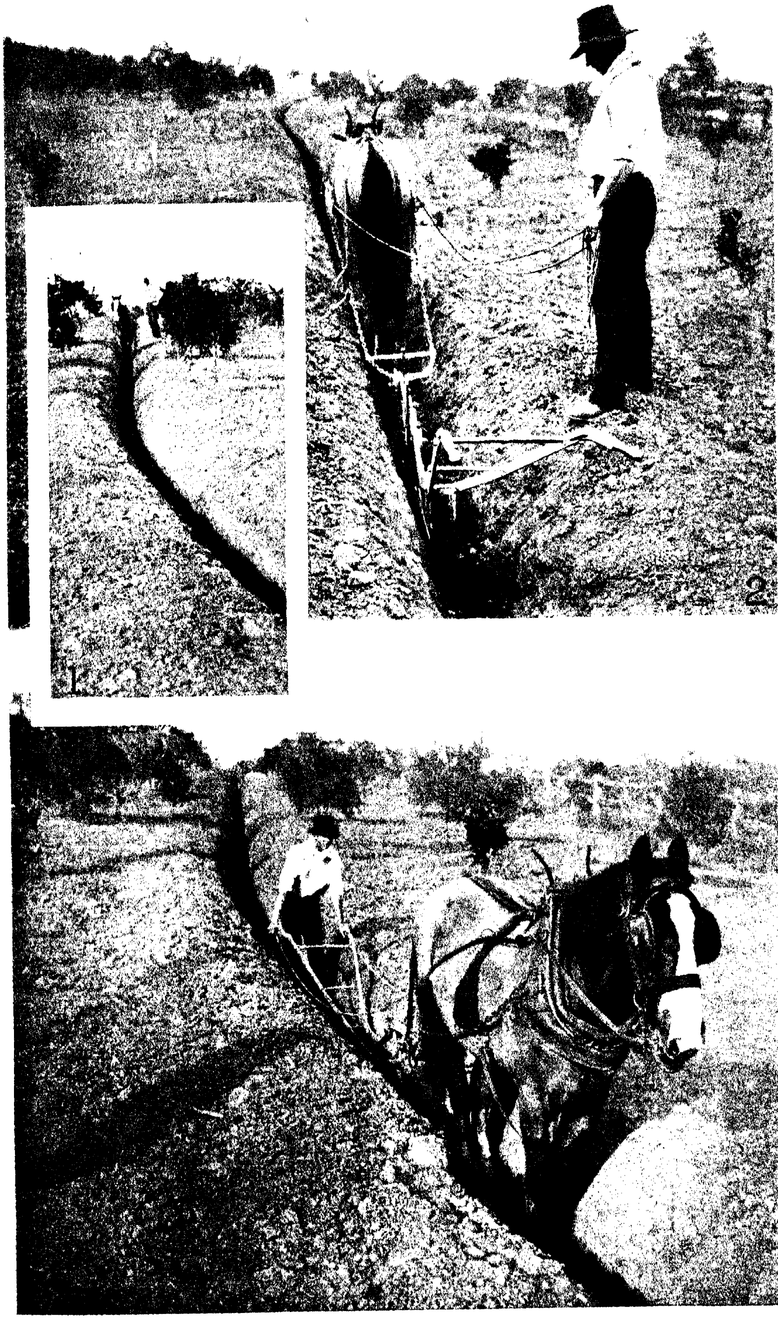
The last, but by no means the least, advantage of draining is the greater power of retaining moisture. So far as actual orchard crop requirements are concerned there is even in the driest seasons we ever

experience in the principal fruit-growing districts of New South Wales an ample *annual* rainfall. The trouble is that it generally falls at irregular periods, and when the rains do come the orchard lands are not always in a condition to absorb every drop and retain a requisite proportion of the moisture. Orchardists cannot control the occurrence of rain, but it is not by any means an impossible task to take measures to conserve the water in the soil itself to tide over dry spells. It has been pointed out in this *Gazette* time and again that the cheapest and most effective reservoir an orchardist or farmer can provide is in the shape of deeply worked, properly drained soil which is kept absorbent and retentive of moisture by the addition of plenty of decayed vegetable matter, or humus, as it is called, and which is never exposed to the drain of unrestricted evaporation.

An inch of rain is equal to about 22,000 gallons per acre. If one can catch that and retain half of it, it is as good as about 100 gallons of water per tree (*i.e.*, on the assumption that the roots extend over a circle of about 10 feet). Yet how often do we see a downfall of an inch to-day and a week afterwards the orchard soil is as dry as a wooden idol. If a man were to cart 100 gallons of water per tree, he would be prepared to swear that the ground had a sufficient soaking to last three months. But the 100 gallons of carted water would get evaporated just as quickly as the inch of rain if no steps were taken to retain it. It might certainly occur to one at first thought that artificial drainage would tend to dry out a soil too rapidly. The fact is that the amount of water any area of ground can absorb and retain depends entirely upon the texture or mechanical condition of the soil. The effect of drainage is to render the soil crumbly, and the more crumbly a soil is the more moisture it will hold for a long time.

The deep working, *i.e.*, ploughing and subsoiling to at least a foot can be done at a cost of about £5 per acre at the most.

Drainage is an item that depends so much upon local circumstances that it is impossible to give a definite opinion as to cost. One sees all sorts of methods of draining and hears the cost quoted at prices from £2 or £3 up to £15 per acre. As an example of what appears to the writer to be a very cheap plan of cutting out the drains, an illustration of Mr. Turner's method is given on the opposite page. The horse attached to the plough happens to be a particularly docile one, and his willingness to walk in a narrow track permits of very great economy in cutting the drain. As will be observed in the illustration, the mouldboard has been removed from the plough and the right wing of the draught adjustment has been cut off so that the plough can slide right alongside the face of the cutting. Instead of the ordinary swingle-bar, a short spreader is used in the chains. In working, the first furrow down and up the length of the drain is turned out with the mouldboard; thenceforward the two furrows or scrapes are made not more than a couple of inches deep at a time where the subsoil is hard. As soon as the plough has been down and has started back a couple of men commence to shovel out, and what with necessary stoppages to chop through an occasional forest root or to spell the horse, the shovels can about keep up. Where a man has



1. Showing the excavation. 2. Showing how the plough is arranged. 3. At work in the drain.

to do most of his work single-handed, as plenty of fruit-growers do, this system is about as good a one as could be desired, because he could start in the morning and break up a few inches and put in time as it could be spared shovelling out. So much has been said and written as to the benefits of a sufficiency of decayed vegetable matter in the soil that one feels afraid of being regarded as a perfect bore for mentioning it. There are two ways of adding vegetable matter to the soil—scraping up leaves and mould in the bush, gathering stable manure, digging out creek beds and muck from ponds and depressions and carting it on to the land and spreading it, or sowing at the cost of a few shillings per acre and at the proper season—autumn—a crop to be ploughed under. If there are within reach ample supplies of bush rakings or stable manure, and there is time to properly compost them with good mould for several months before use, good results may be obtained from the scraping and digging and scratching and carting and spreading; but if one has other things to do and wishes to bring up for the use of his fruit-trees some of the plant-food that lies dormant below the depth he can get at with his tillage implements, he will sow with a slowly-soluble cheap manure a deep-rooting leguminous green crop—tares or vetches, or grey peas for preference.

The cultivation or stirring to prevent evaporation simply means keeping the surface of the soil as roughly broken as one likes in winter and as finely divided as it is possible to get it in summer. Some of this very fine stuff will blow away in the summer breezes, but what does that matter. It takes a terrible cloud of dust to make a dray-load, and it is a jolly sight better to lose a few dray-loads of dust during summer than the hundreds of thousands of gallons of moisture that escape unseen from uncultivated soil. In a thunderstorm the finely divided soil may be liable to wash, but there will be little danger of that if surface drains be provided to prevent rainwater from uncultivated and hard ground running over the cultivated patch. Having done all these things, the modern orchardist is not at liberty to sit down. A few other matters will engage his attention. There is the manure to be applied unless his soil happens to be very rich naturally. In the application of fertilisers one must use a lot of discretion. If a tree is growing like a hurricane and not producing a good crop, it is no use piling on rich stable manure or fowl-yard sweepings or special fertilisers containing a high percentage of nitrogen. Get from a reliable manure merchant a mixture of phosphoric acid and potash. Do not be afraid to use potash. The almost entire absence of that constituent or the unavailability of it in the soil is responsible for the miserable quality of lots of the fruit grown nowadays. One must study the particular wants of every individual tree. Old Mr. Pye of Rockey Hall had a special gift in that direction. He used to ladle out little doses of artificial manures to his trees with such nicety that not only were the trees uniform in size and shape, but he could pull a drayload of fruit off a tree without "skinning it." It is a mistake when using readily soluble fertilisers to put the whole dose on at once—give the trees about three-quarters of their allowance at the beginning of spring and the balance when the thinning of the

crop has taken place. Then come the pests. Some illustrations of Mr. Turner's fruit and trees are given to demonstrate the advantages of one system of keeping scale insects under. Because the experts of this department are rather enthusiastic about fumigation, some people appear to think that departmentally considered there is absolutely no other means to be thought of. As a matter of fact, there are lots of ways of destroying orchard pests, and to go around and cut their throats or attack them with a tomahawk would be better than entirely neglecting any measures, but there can be no question that when an orchardist has once gone in for fumigation he will think very much as Mr. Turner does—that it is the best in the long run.

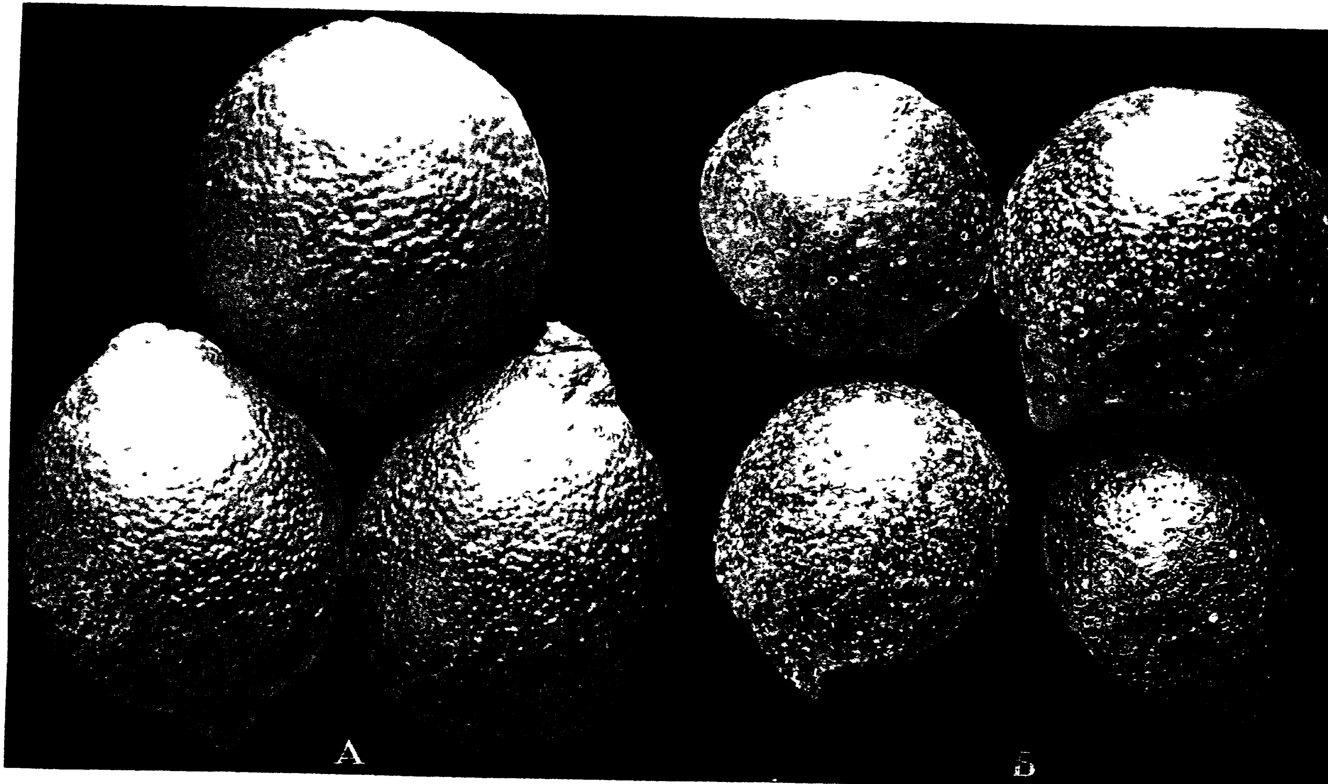
The illustrations of treated and untreated trees and of fruit simply speak for themselves. Mr. Turner has 15 tents, of sizes ranging from 12 feet high and 24 feet in diameter, up to 36 feet diameter, with an octagonal sheet 42 feet in diameter. He finds it economical of time and labour to lay out his work in sets of four trees in a square. As to the best time, he recommends the month of December.

Pruning is another important matter, and it is the one that, in the case of citrus orchards, is most frequently entirely neglected or carried out in a way disastrous to the profitableness and longevity of the trees. Illustrations of one of Mr. Turner's lemon trees pruned after Lelong's system, and of another allowed to grow anyhow, are shown as an example of the benefits of good pruning.

When one has taken the trouble to grow good fruit, it is a pity not to give it a fair chance in the market for the want of a little care in the packing. This is a job that Mr. Turner attends to personally. The fruit is picked and brought into a commodious shed, and every care is taken to not only have each case filled with fruit of a uniform size, but to have the fruit carefully packed in neat rows. Not only is this particularly attractive, but the good packing prevents injury to fruit in transit. For hauling the fruit a spring waggon on the American principle is used, which, with a 10-mile drag over roads not remarkable for their evenness, is another distinct advantage. The stables at Hatfield are a model of comfort and utility; stall accommodation is provided for five horses. Under the same roof, but on a level of about 3 feet above the stalls, is the feed store, entered by a side door as high as the floor of a cart. At the back there is a horse-works connected with the chaff-cutter in the feed store. At each end of the verandah of the stable is a room, and the intermediate space can be used for harnessing up, etc., in wet weather.

A family of pigs live in comfortable cement-floored styes, and there is a miniature bacon-curing house. A couple of hundred fowls are quartered in handy little pens and houses.

Taken altogether, this orchard, like several others in the same district, affords an excellent demonstration of the success that can be achieved by anyone who will undertake the production of fruit on business lines, and who will devote as much thought and systematic elbow-grease to every detail as one would naturally regard as essential in the pursuit of any mercantile calling.



A. Fumigated. B. No treatment.

AVERAGE SPECIMENS OF LEMONS AT HATFIELD [illegible]

New Breeds and Varieties of Fowls.

G. BRADSHAW.

Introduction.

One of the features of latter-day poultry keeping in England and America is the almost yearly addition to the now excessive list of new breeds and varieties of fowls. These are not discovered in some foreign lands, as is disputably claimed for Langshans and some others, but rather a manufacture, the result of matings of two or more of the older breeds, some of the present new varieties being the outcome of an intentional cross to secure a preconceived characteristic in either shape or colour or both; or at times the existence of a breed is brought about in some fancier's yard by a chance cross, the appearance of which strikes the breeder as something novel and worth perpetuating. The fancier then, by scientifically mating, and occasionally breeding back to the parents, if persistent enough, in a few years has established a desired colour, and later on fixes a type to this colour to such an extent that if a pair of these are mated the progeny will partake of the parents' colour and shape to such a degree that the experimenter can, at his option, announce them either as a new breed, or a new variety—*i.e.*, colour of some existing breed. In an exhaustive work on the Orpington fowl, I dealt with the origin of that popular breed, tracing its rise and development in England, America, and here. These birds, as is well known, when first put before the public by Mr. Cook, and called a breed, were a black fowl, but, unlike Langshans, had clean legs. The birds as a breed encountered much opposition from the old fanciers, who would not acknowledge that a cross from two or more breeds could honestly be called a new breed. Many people's temper and much ink were lost over the discussion which continued several years, and it is neither new nor news to say here that the big, black, clean-legged fowl, the result of a cross, triumphed, and has long since been acknowledged by its one-time detractors as not only entitled to the cognomen of a breed, but also to the flattering one of the "Popular Orpington." This black fowl, from the date of its *debut* in 1886 until 1894, was known as the Orpington—any other colour would have been incongruous; and although, in the early nineties, buff was becoming a fashionable colour in fowls, there was not a fancier in England guilty of such heterodoxy as to imagine an Orpington any other color than black, notwithstanding that the originator had a few years previously put in the market a small white fowl, but which has, even to the present day, never been taken seriously as an Orpington. However, Mr. Cook had an eye to business, and realising the craze for buff fowls, produced, by various crosses, a fowl of buff colour and Orpington type, and exhibited a pair of these at the Dairy Show in 1894, calling them Buff Orpingtons. These caused a bit of a sensation, and there was an extraordinary run on the birds by farmers and others who were breeding for utility purposes.

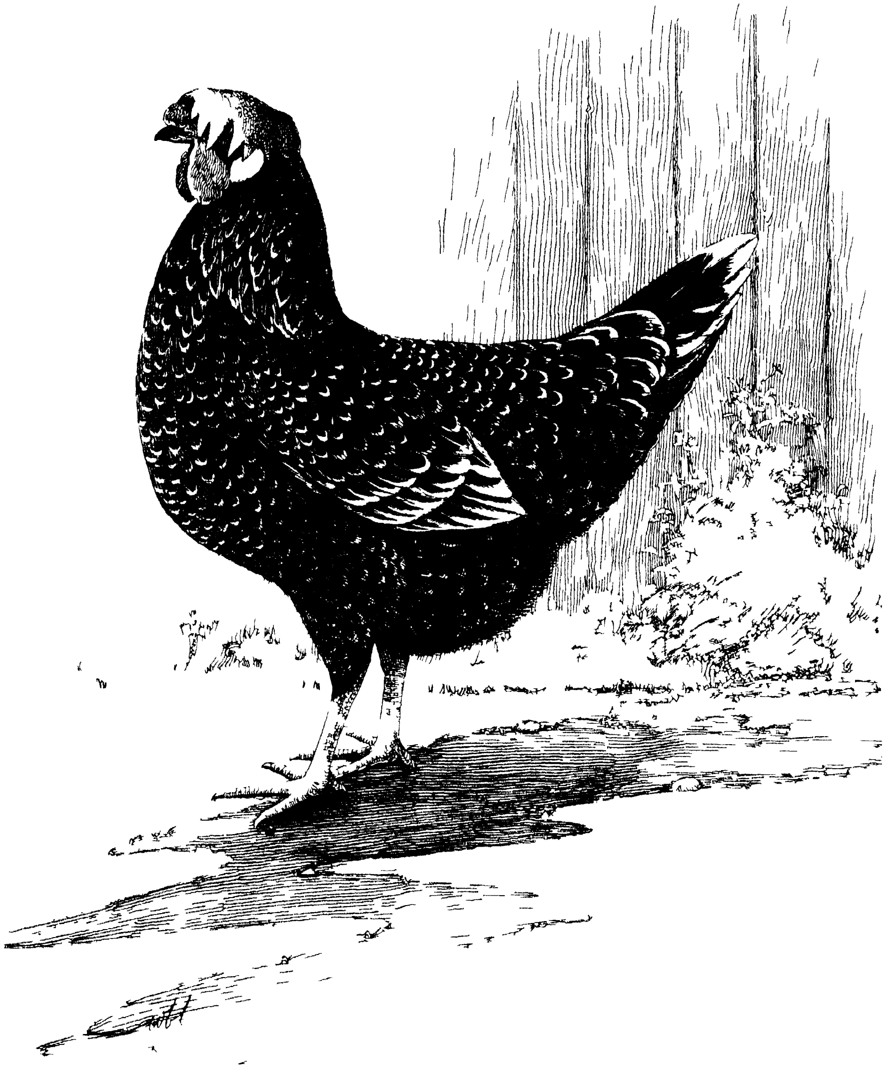
Fanciers, however, fought shy of them at first; but, more serious still, the original Orpington Club in 1895 passed a resolution in the following terms:—"That the Club view with dissatisfaction the providing of classes by Show Committees for other than Black Orpingtons, and the Club refuses to grant medals or prizes to other than the variety recognised by it."

However, this buff variety of the Orpington grew and flourished amazingly, despite the interdict, and at an English Show last year, over seventy of these appeared in one class, and as many as 300 have been exhibited at a single Show, their growth and popularity being as proportionately represented in Australia. The above reference is to show how and why some breeds and varieties of fowls are originated, and here it may be said that type makes the breed, and colour the variety. At the time of writing in 1899, the buff variety had not long been introduced here, but a still newer variety was then referred to—the Diamond Jubilees. At that time I knew nothing of them personally, other than that contained in several communications I had from Mr. Cook, and a few extracts from English poultry journals, and, as this variety arrived since "The Popular Orpington" was written, I purpose including it and the Spangled Orpingtons in "The New Breeds and Varieties." Prior to the Orpington pamphlet, it will be recollected that another was issued by the Department, entitled "The Wyandotte as a Farmer's Fowl," and in no other breed extant have such a number of colours been produced. The work referred to was published in 1898. The varieties then known and written of were Silvers, Golds, Whites, and Buffs; since then there have been produced Partridge, Buff-laced, and Violet-laced, specimens of which have appeared in the Sydney Shows, and will be briefly treated with the other varieties. Another variety which has not been seen here, but which is fairly plentiful in England and America, take after the colour of Light Brahmas, and are termed Columbian Wyandottes. This brings me to the title of the present article, namely, "New Breeds and Varieties of Fowls," which will include Anconas, Faverolles, Campines, Lakenvelders, &c., all of which are now plentifully exhibited in England, and have clubs to look after their interests. The new varieties of Orpingtons, Wyandottes, &c., will also receive attention.

Anconas.

History.

I have already mentioned two ways by which new breeds or varieties of fowls have been produced, and by breeds I mean fowls new in colour of plumage, shape, or type, comb, or other characteristics; and while any fancier, by crossing, may produce specimens wholly foreign in appearance to any hitherto acknowledged as a breed, still this fact does not entitle them to be called either a breed or variety. Another way of adding to our long list of breeds is what may be termed the evolving system, that which supplies the title to this chapter being an illustration. At the present day, many fanciers still believe this breed a creation of the last few years, and, so far as the



AN EXHIBITION ANCONA PULLET

actual appearance of the birds go, they are right. Still, historically speaking, Anconas are one of the oldest breeds or, rather, varieties of the Spanish race we have.

Moubray, one of the oldest writers on fowls, whose "Domestic Poultry" was first published in 1814, in a later edition says: "The appellation of Ancona is also very frequently applied to fowls of the Spanish variety, and the name given may be taken as fairly indicating the source whence it has reached us, for although the local names of Minorca and Ancona applied to some of the sub-varieties might induce the belief that those places are the original spots on which it was found, still the former, distant only 120 miles from the Spanish coast, may, in the first instance, have received it from that country, with which a constant traffic was carried on, whilst the latter may also have obtained it from the same source, it having been, perhaps, conveyed thither by the Dutch, who, from an early period, traded there." Moubray's description of the Ancona, as then known, is as follows: "They are birds of a mottled or speckled plumage,in which the prevailing colours are black and white, whilst, in addition, some have the hackle feathers striped with a reddish-brown."

From the above time until 1853, when the voluminous Martin Doyle put his then valuable work before the public, this sub-variety of the Spanish seems to have dropped out of existence, at least so far as any reference to them can be found in the poultry literature up to the above date. In Doyle's book the Spanish race of fowls get much prominence, and his statements, summarised briefly, are as follows:—"The Spanish fowl has long been naturalised in England, but the original stock has met with several crosses, more or less resembling one or other of its progenitors, and in due course of time a name has been appropriated to these varieties, as though each were a separate species. In consequence of the innumerable crosses which have occurred, it would be impossible to recount the pedigrees of such a heterogeneous multitude, for, when crosses occur, the form, colour, and general appearance of the individuals of a brood, even of the same blood, differ greatly from each other. There are the Blacks, Anconas, Minorcas, Whites, Tasselled, and Double-combed, beside others. The Anconas, of all sub-varieties, show too clearly the results of a cross. There seldom is much white about the face, and in many cases none; the ear-lobe is, however, of that colour, though not so long and full as in the Black. The combs and gills are generally more pendant, and, if examined, the former will be found more deeply serrated and thrown towards the base; but they possess the general characteristics of the Spanish class, and are excellent layers. They are of a very unsettled colour, spotted with white, but far from regularly marked; they also present many other shades and colours." The above description of the Anconas fifty or sixty years ago fairly represents the average birds of to-day, despite the fact that for the following twenty years, say, up to 1870, they had almost dropped out of existence, either as a breed or variety, and were only to be found in the occasional handbooks then devoted to poultry, and were described as cuckoo in colour. Even the well-known

author, Lewis Wright, in his early work of 1860, mentions them as being cuckoo in colour, clearly showing that whatever, if any, specimens were then in existence, they had entirely changed in colour of plumage from the black mottle of 1850 to a cuckoo or Plymouth Rock colour, nor was there much interest taken in the variety for many years after this. Even in so late as the 1885 edition of Lewis Wright, the birds are spoken of as scarce, "a pen appearing at the poultry shows every two or three years, and were generally good for a prize in the variety class". Nor was the colour improved at the date, it still being cuckoo or Dominique. Mr. Wright at this time speculated as to the origin, but advanced nothing new from what the writers of the thirty years previous had set at rest, namely, that the birds were a cross of some of the varieties of the Spanish race of fowls. It will thus be seen that the Anconas written of by Wright in 1867 and 1885, were of the cuckoo plumage, a colour which was neither the original nor yet that adopted at the present day, the authors conclusions then were also at variance with the recognised methods of producing this particular plumage, all of which has been put right in his valuable work issued the present year. The previous edition stated that the origin of the Anconas was to be found in the accidental sports from the crossing of white and black Minorcas, the result of crossing very dark fowls with white being often productive of a certain number of cuckoo colour, and the prepotency of this Plymouth Rock colour when once produced makes its transmission, even from a recent cross, comparatively easy. Why Mr. Wright acknowledged these Dominique coloured birds of that period as the correct one for Anconas is not apparent, seeing that he had access to all the earlier poultry literature, which described them as black mottled with white, and the further fact that some of the correct colour were then in existence, for Mr Wright in the same page says:—"Birds have been exhibited under the name of Anconas of other colours then described; we have known birds splashed black and white called by that name, such have, however, no claim to a title of a distinct breed," and to show how his opinion differs from both the early authors and those of the present day in his standard for judging this variety, birds with white or black in plumage were to be disqualified in the show-pen; the early description of the birds and the present day standard being a complete reversal of this, the birds now being disqualified for any coloured feathers other than black and white. One feature of the Ancona stands out prominently, no matter whether written of now or 100 years ago, and that is in respect to their qualities as egg-producers. The few early references to their useful qualities being "fine layers," "wonderful egg-producers," "layers of white eggs of a useful size," while one breeder of about thirty years ago described them as "very hardy, and no end of laying." The above information is really all that is known of the early history of the Ancona, while the following extract from the "Book of Poultry," issued the present year, will form a connecting link with the breed's early and present day history:—"One of the most popular additions is that known as the Ancona; but there can be no doubt at all that it should be classed

with the Leghorns, and is a variety of that family. The only distinction which possibly could be drawn, would lie in the characteristic activity and wildness of the original breed, but that is shared fully by the black Leghorn, which in all probability is one of the Ancona's ancestors, and all the 'points' are in conformity with the Leghorn type. It is curious that from time to time several fowls have appeared under this name, but all showing a mixture of black and white blood. The earliest we remember (about 1864) were cuckoo coloured, and dusky or leaden in the shanks. Unacquainted then with the Leghorns which arrived years later, we naturally put these birds down to probable crossing of black and white Minorcas, in harmony with what we knew of colour production; but there can be little doubt now that they were really Cuckoo Leghorns or Anconas. They were, at all events, then called Anconas, and ten years or so later, we several times saw birds of the same type and called by the same name, but mottled or splashed with black and white like Houdans, instead of blue barred—in fact, like the present Anconas. In the light of these simple facts, few as they are, it seems clear that in the neighbourhood of Ancona there has been a general mixture—probably without any definite attempt at crossing—of a black Leghorn with white or light colours of the same family, whose results, both in blue-barred and mottled plumage, have been so marked as to give the local name. Should this be so, the extreme wildness of the black Leghorn, noticed above, would account for the same characteristic in Anconas, and the black Leghorn must be regarded as the real ancestor of this variety. To such mixed ancestry may probably be attributed the extreme hardiness and prolificacy which distinguished the Ancona when first really taken up in this country. As a layer it was almost without a rival, quite a number of breeders reporting 200 eggs per annum, and its remarkable hardiness in regard to anything except foul air, or tainted ground, or extreme wet, was also soon observed. The breed at that time might be described as a Leghorn with plumage like that of a Houdan."

Modern Anconas.

As already mentioned, when a new breed of fowls has been introduced to the English public, it has either been manufactured or made by the crossing of some of the older breeds, or, as in a few instances, been brought to foreign countries, and to which of the two or other source our present-day Anconas are indebted for their existence, readers will, from the early and modern references, be able to draw their own conclusions, and this, despite the fact that many attempts through the poultry press in England have been made to write them down as a cross between the black and the white Minorca, or the black Minorca and white Leghorn. The majority of the writers asserted that they could be so produced. The actual Ancona breeders as firmly denying this, and describing such statements as mere guess or theory. However, irrespective of the actual lineage or ancestry of the birds seen in England between 1830 and 1870, it is a recorded fact that Captain Rowle, of the s.s. "Bugle", about 1884, brought to England a dozen

birds direct from Ancona, and further importations in 1887, and whether these birds were kept and bred pure, or the blood got mingled with those in England already bearing that name is not important; suffice to say that about a dozen years ago Anconas were getting moderately plentiful, and were to be found in quite a number of English poultry yards, and at some of the important poultry shows a pair of them could usually be seen in the any-other-variety classes. The frequent appearances of them here with an occasional first prize attached was responsible for them getting talked and written about to such a degree that an agitation arose amongst their patrons to get them recognised as a breed, and due acknowledgement in the show-pen. These efforts of the breeders were crowned with success in 1896, when the management of the Brigg Show were prevailed upon to insert two classes for Anconas, with the result that six cocks and nine hens appeared in open competition, this being the first public appearance of these black and white fowls competing against each other as a recognised breed. I have already said that these birds became to be fairly well known and written about in the early nineties, all the old poultry works being diligently searched for anything of interest to send along the then poultry craze. Martin Doyle in 1854, says:—"The Anconas of all sub-varieties show too clearly the result of a cross. There seldom is much white about the face and in many cases none; the ear-lobe is, however, of that colour, though not so long and full as in the black (Spanish). The comb and gills are generally more pendant, and if examined, the former will be found more deeply serrated and thrown toward the base; but they possess the general characteristics of the Spanish class, and are excellent layers. They are of a very unsettled colour, spotted with white, but far from regularly marked."

Fifteen years later, John Bailey in his book on fowls, says:—"The Ancona, although it has been before the public for some years, has made little progress in becoming a favourite. It is not surprising, as it is more curious than handsome. Its chief peculiarity is a comb of most unusual size, which hangs over, entirely concealing one side of the face; its wattles are also very long and large. It is rather undersized than otherwise, and short-legged. The common colour is black intermixed with white feathers. They are said to be prolific layers, and to produce unusually large eggs." Miss E. J. Minards, of Cornwall, wrote in 1893:—"I have lately gone in for this breed and when thinking of doing so, my mother said, 'They are capital birds; I kept them at Givenapp fifty years ago.'" Mrs. Bourlay, Frankley Rectory, Birmingham, contributes the following: "From an experience of several years, I have found them most profitable as winter layers of good-sized eggs, for, being of very active habit and always on the move, they do not seem to feel the cold weather which so seriously affects some of the heavier sorts of birds. They are extremely hardy and strong, and flourish in the coldest and most exposed situations (such as our own, 730 feet above sea level), seldom suffering from any ailment if not overfed or kept in badly ventilated houses. I also hear from many of my customers that they do very well indeed in small and confined runs. The chickens are lively and very 'forward,'

developing with great rapidity under proper treatment. The cockerels begin to crow and should be separated from the pullets at two months old, and pullets often begin to lay at four months. As in all mottled varieties it is not easy to breed the ideal bird, but careful selection does much, and we may hope to succeed in time, without, I earnestly trust, losing those useful qualities which make them the workingman's birds as well as the pets of the fancier."

Miss Phyllis H. M. Eliot, The Vicarage, Wellesbourne, Warwick, says:—"Respecting my experience of the Ancona fowl, I have pleasure in saying that I find them very excellent as layers. They are also singularly healthy fowls, and the chickens are particularly hardy and easy to rear. They are excellent foragers, and not at all hungry fowls, and being a light, active breed, do best where they can have perfect liberty. They are only fair table fowls, but owing to their small bones, an Ancona hen, properly cooked, might easily pass for a spring chicken. They are pretty and very uncommon in appearance, and our flock in a large grass field attracts a good deal of admiration. I think, taking them all round, they are the most generally satisfactory breed. I should have no hesitation in recommending them to anyone beginning poultry keeping."

Miss Ada Gaunt, Alvechurch, writes:—"I have kept Anconas since 1895, and have found them more profitable than any other breed I had hitherto kept. They are excellent winter layers, laying after my other hens have left off, and commencing again earlier, taking very little rest. Some people complain that they lay small eggs; they do when quite young, but afterwards their eggs often equal the Minorca's in size. I have found them most easy to rear, having scarcely lost a chick, although our soil is cold and rather damp. It has been said that they are not a good table fowl. I have found that they have given every satisfaction, the meat being tender and delicate, the breast long and plump, and legs and bones small. They are capital foragers, consequently inexpensive to keep. I am sorry I have not kept an exact account of the number of eggs they have laid, as I feel sure they would compare well with any other breed."

The above contributions are but a few samples of the many on this subject, which appeared in the English poultry press in the years 1898 and 1899, all of which assisted in bringing the Anconas into more prominent notice, and enlisted many supporters for the breed.

The London and provincial newspapers, not to be behind when any new sensation was on hand, had also occasional references to the new breed, the following from *Lloyd's Weekly Newspaper* being typical of numerous articles which appeared on the subject:—"Amongst the new breeds that are in no way indebted to fashion or loud advertisement, but which are steadily gaining in public estimation, solely through their merits, are the Anconas. The special faculty of this fowl is to lay a large number of eggs, particularly in the winter, neither frost nor wet having any effect on them in this respect. Some years ago, the black and the white Minorca were crossed together, and the offspring thus produced were described in the poultry books of the day as Anconas. But these were not the true Anconas, and

the birds of that name now seen are very different. About twelve years since, some fowls were imported from Ancona, in North Italy, by Captain Rowle, of the 'Bugle.' These appear to have attracted but little attention at that time, but being again brought to this country from Ancona in 1887, they were exhibited at several shows, where they were much noticed. Since that date, they have steadily increased in popularity, and the present Anconas had their origin in these birds. In appearance, the Ancona takes much after the Leghorn in shape, with the plumage black and white mottled, and the beak and legs yellow. In the cock bird the comb is large, upright, and single, with deep serrations; the ear-lobes are white, the wattles large and of fine texture, the hackles and body feathers black, edged with white, and the tail with long sickle feathers of black and white. The hen has a large single comb, falling over the face, and her plumage should be as even in marking as possible, every feather being black tipped with white. In many specimens the legs are spotted with black. This is a point that the fancier will doubtless object to, but it is hoped that if he attempts to breed for yellow legs only he will not interfere with in any way, or sacrifice the splendid laying qualities of the bird, as has already been done in the case of other originally useful fowls."

Anconas in England.

If any breed of fowls got a good send off on the road to popularity Anconas certainly are the breed. A remarkable feature, and what assisted largely to this end, being the fact that the principal breeders and patrons in the days of its nativity were ladies, every one of whom talked of Anconas, wrote of them, advertised them, and agitated for them, until 1896, when they influenced the committee of the Brigg show to provide two classes for the breed, and from that day until the present Anconas have literally boomed, and that there was a legitimate reason for this boom none of its patrons yet deny. The one overwhelming characteristic as embodied in every contribution on the subject being that of extraordinary layers of a good marketable sized white egg. Amongst those largely responsible for the present day prominence of the breed in England are the Hon. Mrs. Deedes, of Hythe, Kent; Miss Phyllis Eliot, The Vicarage, Wellesbourne, Warwick; Mrs. Mynors, Weatheroak Hall, Alvechurch; Miss Ada C. Gaunt, The Cottage, Alvechurch; Mrs. Bourlay, Frankley Rectory, Birmingham; Mr. E. P. Chance, Edgbaston; E. Cobb & Co., Tatenhill, Burton on Trent; Heap Bros., Burnley; Mrs. Barnes, Toltington, Bury; J. Ashton, Brigg, Lincolnshire, &c.

The plentifulness and popularity of any breed of fowls can generally be fairly well gauged by the number of them which appear at the large poultry shows; these shows just being as true an indicator of the decadence of a breed. The managements, however, of these large exhibitions have always to be satisfied as to the stability and prospects of a new breed before they venture to give such a special classification, hence for a couple of years, beginning at Brigg, a large number of the English provincial shows catered for Anconas, the big classical fixtures only looking on with interest, until the winter of 1898 when the British

Dairy Association, seeing they could no longer ignore the claims of the patrons of this breed, assented to the insertion in their poultry programme two classes for Anconas, one each for cockerels and pullets, *i.e.*, birds bred the same year. The response from fanciers was fully up to expectations, twenty-four exhibits appeared; the following year they rose to fifty-eight; and the third year of their appearance at the Dairy, in 1900, the two classes contributed seventy-eight exhibits, this being a more rapid rise to show-pen popularity than that recorded for any other breed during the same period.

At the Dairy Show of last year the numbers were slightly reduced, this, however, was not attributable to any lapse of interest in the breed, but rather to the fact of a rather more exacting standard having been adopted, which in one section alone handicapped many hitherto good specimens from much chance of an award; this matter, however, will be duly noted in that chapter dealing with the judging of Anconas, suffice here to say that this rather small fowl of a black and white colour, and Leghorn build, continues in England one of the favourite breeds, its patrons for exhibition purposes are numerous and increasing, while those breeders who eschew the show-pen and value fowls only for their commercial worth as egg-producers are regularly enlisting in the Ancona ranks, at the expense of some of the older varieties or those of mixed parentage.

Anconas in Australia.

When writing on the various breeds in 1899, Anconas were attracting a good deal of attention in England, and in my brief introduction to the breed, I said: "Anconas cannot correctly be called a new breed, but rather a resuscitated old one, their most wonderful laying qualities being responsible for the prominent position they now occupy amongst the breeds noted for excessive egg production," and concluded with the following:—"Anconas have not yet reached Australia, and when they do their profitable character should soon establish them in public favour; hence those interested in the first importations will find the speculation a profitable one.

Generally speaking poultry are kept for either of two purposes, or both, first as an industry, its object which like all others is profit, and that this result is not always attained does not affect the object. The other purpose is as a hobby—something to satisfy the cravings to which most people are subject, to relieve the monotony of one's every day existence, by exercising the brain in a direction other than that of its daily occupation, one writer not inaptly describing hobbyism as something to give the brain a holiday.

This hobby, when applied to poultry, is usually associated with pure-bred or prize fowls, the hobbyists' ambition being to produce some specimens more to an ideal than that hitherto produced by others working for a like purpose. This leads to the competitive spirit which has its outcome in the poultry shows, and prizes. These prizes enhance the value of the owner's stock by creating a demand for these superior specimens, and thus the hobbyist who possibly had no other object than providing an interesting pastime for his leisure moments,

by attempting to produce some special feather or shape, is unconsciously launched into the great sea of commercialism, fancy fowls, *i.e.*, exhibition birds being now as consistently bred by their owners with the object of profit as are those of less blue blood by the poultry farmer who has no other source of income, hence when I wrote four years ago that the first importers of Anconas to this country should do well with them, I felt sure that some of the enterprising fanciers would soon take up the cue, and I was not disappointed. Whether the results have so far warranted my then sanguine expectations and predictions is for others to judge, certain it is that varieties of other breeds then also unknown in Australia, and for which I had a good word, have since arrived here and taken the popular taste to a greater degree than Anconas; however, the popularity which these latter varieties enjoy is due to causes which will be fully explained when dealing with them individually; suffice to say we have numerous Ancona importers and breeders in this State now, and as the majority of these breeders have and do keep other varieties of fowls as well, they are the people who can supply first-hand information about the quality of these fowls, and as they are well-known breeders of repute, their experience on this subject should form a lasting testimony to the merits or otherwise to this, to Australia, new breeds of fowls, and to secure the unbiassed opinions of these the pioneer breeders of Anconas in this country, I some time ago addressed a circular as follows:—

1. How long have you kept this variety of fowls?
2. If imported or purchased in Australia?
3. Your experience of them as layers?
4. Do you find any difficulty in rearing the chickens?
5. Do you find any trouble in keeping them confined, as they are reputed to be very wild?
6. How are eggs for size in relation to Leghorns or other breeds?
7. Is there much demand for birds or eggs?

Mr. A. J. Lurcock, of Lambert Grange, Parramatta North, is one of the oldest breeders of prize stock in this State, nearly every variety of fowls having received his special attention during the past twenty-five years, and as a poultry judge at the shows in this State and Victoria his repute is of the highest. Mr. Lurcock, reading about the boom in Anconas in England, and their great laying properties, at once realised what I have often reported about new breeds of fowls, namely, those who are in the boom first make the most money out of it, and early in 1899 determined to have the honor of bringing out the first Anconas to Australia, and his experience in all classes of farm stock had long since convinced him that the best are always the cheapest, hence when he gave his commission to Mr. E. P. Chance, of Edgbaston, England, he selected one of the most successful breeders and exhibitors at that time. Mr. Lurcock's experience is as follows:—"I believe I was the first importer of Anconas from England, and have kept them now for nearly three years. I have no desire to depreciate the qualities of any other breed of fowls, but I must say of the Anconas, that in all my experience I have never found their equal as layers, and this in-

the face of the fact that I am in a most exposed position, right on the top of a hill. I have found no difficulty in rearing the chickens. They are very hardy, and grow quickly, the pullets often beginning to lay at four months' old. I have had very little trouble keeping them confined. I usually tie one wing when putting them in the breeding-yards, and after a few days there is no further trouble, but if running in a large yard they are a bit afraid of strangers, and will scoot away on the approach of anyone strange to them. The eggs compare well with Leghorns, being a shade larger than those laid by the Browns. The demand has been very fair for both eggs and fowls, in this State, Queensland, Tasmania, and New Zealand, and I think when they become more generally known they will be more sought after as a profitable variety, that is if breeders do not sacrifice their laying qualities for show points, which I do not intend to."

From the above it will be seen that Mr. Lurcock's experience with the breed in Australia is exactly like that of its several English advocates earlier referred to in this article. The birds are more than generous layers of eggs larger in proportion to the size of the fowls. They are a little wild, but this, as is seen, can be easily controlled. A noticeable property is that of the very early age at which many of them commence to lay, many of our present day and more numerously-bred varieties or breeds not commencing until they are double this age. However, further reference on this very important point is reserved for the chapter on Anconas as egg producers. The important subject of sacrificing the laying properties for show points suggested by the writer is also deferred for later consideration.

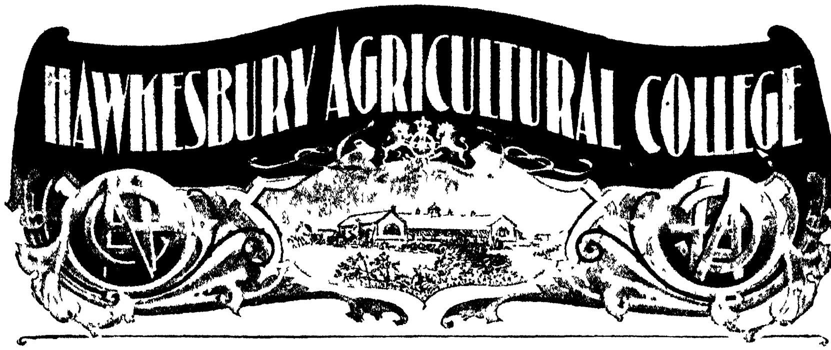
Mr. Ben Pryor, of Greta, who for the past few years has been an exhibitor of prize fowls, and now a prominent breeder of Anconas, contributes as follows:—"In December, 1899, I decided to try Anconas, and accordingly placed an order for a good unrelated pen with Mr. W. Cook, of Orpington, Kent. The birds arrived at the end of March, 1900. I have found them very good layers of fine white eggs, over the average size, much larger than the Orpingtons, which are bigger birds. They certainly are a very frightened fowl, but still, if treated quietly, they can be made to almost eat out of one's hand. To my mind, they possess all the characteristics of the Leghorn—in fact, might be called Spangled Leghorn. I have found a very ready sale for both birds and eggs, so much so that I have never any surplus stock on hand. Both birds and eggs I have supplied to breeders in Tasmania, Victoria, Queensland, and many places in this State. There is no more difficulty in rearing the chickens than that experienced with other breeds. So far, although numerous sales have been made, they have not caught on with the public so much as they deserve; for in addition to being layers of large quantities of fine white eggs, they are good foragers, and on large runs should be very profitable, as they will secure most of their food by scratching, as they are not lazy. My birds have been kept in confined yards, which is not an ideal place for this active breed, still they have been most satisfactory, and fully justify what has been previously written of them."

Mr. W. H. Tombs, of Lambridge, Penrith, a successful exhibitor of this breed, says:—"I have kept Anconas since shortly after their arrival in this State. I have birds imported from England, and also from the yards of Messrs. Pryor and Lurcock. I find them wonderful layers from June to December, my birds last year averaging 165 eggs per hen. The chickens are hardy, easy to rear, and grow fast, and the pullets commence to lay at an early age. They are good foragers when at liberty; are moderate eaters, and wonderful layers of large white eggs for the size of the fowl. They are not of much account for table purposes, but I have crossed them with Orpingtons and Wyandottes, the progeny being a large plump table bird, and an excellent laying cross. They are a lively and attractive bird, and as egg producers they are hard to beat."

Mr. G. T. Hemsley, of Moss Vale, a successful prize-winner with this breed, says:—"I have kept Anconas now for two years, having imported five birds from England. These proved exceedingly fine layers of very large eggs. The chickens from them were hardy and quick growers, maturing about the same time as Leghorns. They certainly are rather wild where running at large, but when confined and handled quietly are as tame as any other breed. Three of the four imported hens laid larger eggs than the average Minorca. As pullets commence to lay early, the eggs at first are rather small, but later on increase to the usual size. There is not a great demand for this bread yet, possibly the colour being against them. I have proved them to be excellent layers, particularly towards the end of winter; they laid when even half bare of feathers at moulting time. My opinion is that a good laying strain of this breed will be equal egg producers to either Leghorns or Minorcas."

Mrs. T. Oatley, of Moss Vale, a successful breeder and exhibitor of this and other varieties, writes:—"I have kept this variety since the spring of 1900, and commenced with eggs from Mr. Ben Pryor, birds from Mr. Lurcock, and have also Mr. Tombs' strain. My experience of them is that they are splendid layers of large white eggs in spring, and right through the summer and autumn, and fair winter layers. I have found no trouble whatever in rearing the chickens, if kept out of the damp. My pens are 2 ft. 6 in. palings, topped with 3-ft. wire netting, which they never attempt to fly over unless a stranger enters the pen. As they are very nervous, I always attend to them myself, and move amongst them as quietly as possible, so that they may become used to one person, otherwise they will fly like magpies. Taken all round, they lay larger eggs than the Leghorn; in fact, I have some that lay eggs quite equal to the Minorca in size. There is not a great demand for the birds or eggs so far. I, however certainly think they are a class of bird that will take on, as it takes very little to keep them, for they are excellent foragers. They not only scratch the surface of the pen, but will turn it over for 15 to 18 inches deep; and although often supplied with green cut bone, they do not seem to appreciate it like other fowls."

(To be continued.)



AND EXPERIMENTAL FARM.

Trials of Grasses and Fodder Plants.

GEORGE I. SUTTON,
Experimentalist.

From the foundation of this College, grasses both native and exotic have been grown here and their characteristics and habits studied. It is only within the last few years that it has been possible to locate them in what may be regarded in some measure as a permanent situation.

Early in 1901, owing to the steady increase in the number of grasses and fodder plants arriving at the College for observation, it was decided to remodel and extend the area devoted to the trial of grasses as it then existed. During the winter of 1901—15 months ago the present site was selected and systematically laid out. It is so arranged that it can be extended without interfering with or marring the general scheme and arrangement of the present grass plots.

The Site and Soil.

The site is almost at the base of a slight incline with a north-east aspect.

The soil is of a tough, tenacious nature—a pipeclay loam—and extremely poor, so poor that those accustomed to our rich grazing lands will be at a loss to imagine how poor it is, unless they have visited Richmond.

On account of the tough, close texture of the soil, which bakes after the slightest shower, it is almost impossible to get small grass seeds to germinate successfully.

With valuable or scarce grasses, the plan of raising the grass in more suitable soil, and then transplanting the roots, has been adopted.

Poor and unsuitable as the soil is, it was the best obtainable for the purpose required. In order in some measure to improve it a dressing of farmyard manure, at the rate of 15 loads per acre, was spread over the site. The ground was then thoroughly ploughed, harrowed, and brought to a fine tilth.

D

Arrangement of Plots.

The garden is rectangular in shape, 64 yards long and 29 yards wide. It contains 100 beds or plots, which are divided into three series.

In order to break the monotonous appearance which such a number of uniform rectangular plots would present, the corner beds were increased in size and made L shaped. This arrangement causes the centre series, which have been devoted to fodder plants, to be entirely enclosed by the two outer ones. The centre plot of the middle series is diamond shaped. With the exception of this centre plot and the corner ones, the plots are uniform in size and shape. The plots are 27 feet long and 3 feet wide; between each plot, as a division, is a pathway 15 inches wide.

It will be seen that the plots, though quite large enough for the study of the characteristics of a grass or fodder plant, are not large enough to admit of reliable calculations being made as to yield per acre, or of stock-carrying capacity. Nor are they large enough to admit of experiments with top dressings being carried out.

During last winter the whole of the plots were top dressed with stable manure.

No attempt has been made to modify climatic conditions by watering or irrigation. As it is impossible to graze such small plots, the grasses, after flowering, are cut close to the ground in order to have conditions resembling as far as possible those under which the grasses would be grown.

Some Notes on the Drought-resistance of the Grasses during 1901 and 1902.

Native Varieties.

Awnless plume grass (Stipa micrantha).—Of all the grasses grown this season, this proved the most vigorous and the best drought-resister. It grows both winter and summer; is both a hay or pasture grass. It is very leafy and succulent, retaining both qualities during the hottest and driest weather. It spreads well from roots, and is a vigorous grower, reaching a height of 2 ft. 6 in. It flowered during November.

Love grass (Eragrostis leptostachya).—This is a very pretty, ornamental grass, good for grazing, but too weak in the stalk to stand erect when alone. It has a very pleasant smell, and, if mixed with other grasses, would impart a pleasant aroma to the hay made from the mixture. It seeds prolificly, and resists drought and heat well, but dies down as winter approaches, becoming green again in spring.

Brown's love grass (E. Brownii).—More erect than *E. leptostachya.* In flower early in January, when about 2 feet high. After flowering it dries off and loses its succulence until early spring, when it commences to grow again.

Panic grass (Panicum effusum).—Only one plant survived the transplanting. It seeded well, and had the appearance of being a good hay grass.

GRASS EXPERIMENTAL PLOTS, H. A. COLLEGE.

Windmill grass (Chloris truncata).—This showed hardy drought-resisting qualities. It kept green and succulent until January, when it became brown, but still furnished a good bite for stock. It is evidently a good pasture grass, though not as valuable for hay as some of the others.

Brown flowering swamp grass (Diplachne fusca).—This grass kept green during the summer, though it did not grow vigorously or spread well. It flowered during November.

Blue grass (Andropogon affinis).—Resisted drought well. Appears more suitable for pasture than for hay.

Wallaby grass (Danthonia semiannularis).—This grass grew very slowly, and attained a height of 15 inches. It became very dry during the hot summer. It flowered during September.

Kangaroo grass (Anthistiria ciliata).—Failed to grow from seed or from roots.

Exotic Grasses.

Natal Red Top (Tricholœna rosea).—This grass grew freely from seed. It is a summer grass and a rapid and vigorous grower. It resisted the drought splendidly and seemed to revel in heat. It grew to a height of 2 feet 3 inches, died down on the appearance of frost, but started into growth again when they ceased in the spring.

Milium multiflorum.—This is a summer and winter grass, growing all the year round. It is very leafy. It resisted drought well, retaining its colour and succulence. It grew and spread well from roots, retaining a height of 2 ft. 6 in. Flowered during November.

Piptatherum multiflorum.—Grew and kept its colour both summer and winter. It is very similar though not as leafy as *Milium multiflorum.* Flowered during November.

Piptatherum Thomasi.—This grass is erect but does not spread well. It resisted drought well, retaining its colour and succulence, and reached a height of 2 feet. The leaves and stalks are rather harsh. Makes fair growth during winter. Flowered in November.

Piptatherum paradoxum.—Similar but more leafy and spread better than *P. Thomasi.*

Canadian Blue Grass (Poa compressa).—Resisted heat and drought well; grows also in winter. Flowered in December, when it had reached a height of 2 ft. 9 in. In appearance it is somewhat wiry, but on examination it is found to be quite succulent and soft.

Texas Blue Grass (Poa arachinifera). A cold-weather grass. It grew well during the winter and until hot weather set in, when it lost its colour and succulence; as autumn came on it rapidly regained them. Flowered early in October, when 15 inches high. Stalks are rather hard but fairly succulent.

Prairie Grass (Bromus unioloides).—Did not resist drought or heat well, but made splendid growth in early spring. Flowered during October when about 18 inches high.

Hungarian Forage Grass (Bromus inermis).—Resisted drought and heat well, retaining its succulence during the hot weather. It is

very leafy, and apparently more suitable for grazing than for hay. It did not seed well, only a few plants forming seed heads. It is only fairly vigorous and spreads slowly.

Blue Grama Grass.—A very fine slender pasture grass, flowering during November, and at its best during December. It retained its colour, a blush tint, during hot weather; on this account, and on account of its fine texture, it should be suitable as a lawn grass. Seeded fairly well.

Buffalo Couch (Stenotaphrum americanum).—Grew all summer, spreading and creeping over the ground. A hardy but rather coarse pasture grass.

Paspalum dilatatum.—Grew freely from roots and spread well. It is a vigorous grower, semi-creeping in habit. It resisted drought and heat remarkably well. Grew 2 feet high. Flowered twice during year, viz., in December and in May.

Paspalum virgatum.—A vigorous summer grass. Grew to a height of 5 feet. It is upright in habit. The leaves are fairly succulent, but the stalks are very hard and woody.

Paspalum gulmarra.—A slow-growing summer grass, creeping in its habit. Made very little growth. Died down during winter.

Paspalum scrobiculatum.—Resisted the drought early in summer; apparently a good pasture grass, rather upright in character; grew about 12 inches high. Seeded very well.

Chewing's Fescue (Festuca durinscula, var. Chewings). The only fescue deserving of mention. It makes no growth during summer, but during winter and spring it would afford a good bite for sheep.

Fodder Plants.

Sheep's Burnet (Sanquisorba minor). This proved an excellent drought and heat resisting fodder plant, keeping green through the whole year, and furnishing fodder of the most succulent description during the hottest and driest weather. It grew freely from seed.

New Zealand Spinach (Tetragonia expansa).—Seed sown in July produced by December a dense mass of fodder 15 inches deep all over the bed. This was cut and fed to sheep, but was not eaten readily. The plants made no second growth.

Sacaline (Polygonum sacalinense).—This plant grew well from roots; but the fodder it produces is of little value, being tough and woody, resembling vine cuttings very much. It dies down about January, and does not commence to grow again until late in spring.

Sulla (Hedysarium coronarium).—We were successful in securing only two plants from the seed sown. These plants grew and spread along the ground, forming very succulent fodder, which kept green and succulent right through the hot summer, and kept growing right through the winter. The larger plant now measures 5 feet in diameter. Flowered freely in October.

Sainfoin (Ornithopus sativus).—Only a few seeds germinated. The plants grew well during the hot, dry weather, retaining their colour and succulence. It is upright in habit. It flowers freely early in October; the flowers prove very attractive to bees.

Sturt's Cotton-bush (Gossypium Sturtii).—Only one plant grew; this developed into a small bush 12 inches high. It is now spreading. In September, 1902, it was attacked by aphides, which destroyed the young shoots.

Phasemy.—A reputed new fodder plant from America. It is an annual, ripening seed and dying down in autumn. It grows as a small bush with very woody stems. It apparently has little value as a fodder.

Spineless Prickly-pear or cochineal cactus (Opuntia coccinellifera).—All that can be said of this plant is that it keeps alive. It makes very little new growth.

Teasel (Dipsacus fullonum).—In spring this plant, in its young stage, is very succulent; but as summer approaches it becomes very hard, and quite unfit for stock feed.

Yarrow (Achillea millefolium).—This plant grows well in spring. The leaves are succulent, but stems are very woody. It proved of no value as drought-resister.

Prickly Comfrey (Symphytum asperrimum).—This plant grows freely from root cuttings, but makes very little growth, and that only during the cool weather of spring. During summer it becomes burnt off, and makes no growth until the next spring.

Saltbush.—Seven varieties of saltbush were planted out; but of these only the narrow-leaved saltbush (*Atriplex angulata*) grew. The plants developed into small bushes 15 inches high.

Other grass and fodder plants, in all 109 varieties were tried; but either the seed did not germinate or the plants made so little growth as to be unworthy of special mention.

Egg-laying Competition Conducted at the Hawkesbury Agricultural College.

D. S. THOMPSON,
Poultry Expert.

The competition originated out of a controversy between Mr. A. E. Henry, of Ryde, and Mr. H. E. Kelly, of Campbelltown, as to the respective merits of Silver Wyandottes and Buff Orpingtons. The controversy was an interesting one, and was followed closely by the great number of poultry readers throughout the State, some favouring Mr. Kelly in his arguments for the great merits of the Buff Orpington, while many others inclined their support to the Silver Wyandotte. Eventually Mr. Henry challenged Mr. Kelly to put up a certain number of hens of each variety, and have the matter tested. Others wished to make the matter an open contest, and the *Daily Telegraph* suggested a laying competition, and undertook the whole work of organisation, besides donating a sum of £21 for prize money.

A committee was appointed to draw up rules and conditions, and a deputation appointed to wait on the Honorable John Kidd, Minister for Mines and Agriculture, who, on the advice of the Principal of the Hawkesbury College, Mr. Valder, and Mr. D. S. Thompson, the Poultry Expert, agreed to have the necessary number of pens and houses constructed for the carrying out of the competition at the College.

The pens were each 57 feet x 17 feet and constructed of substantial ironbark posts and 6-feet wire-netting. The houses (each divided to answer for two pens) were 11 feet x 6 feet, and 5½ feet high in front and 1½ feet at the back. The fronts were open wire-netting, with a north-easterly aspect.

The competitors elected from among themselves by ballot the following names of gentlemen to act as a committee:—James E. Pemell, L. L. Ramsay, W. Harris, A. E. Henry, and H. E. Kelly, to act in conjunction with the Principal of the College, Mr. George Valder, (and subsequently Mr. H. W. Potts, who succeeded Mr. Valder as the Principal of the College), and the Poultry Expert, Mr. D. S. Thompson, with Mr. A. A. Dunnicliff, junr., representing the *Daily Telegraph*.

In opening the first meeting of the Committee, Mr. James Pemell, who was unanimously appointed Chairman, said he considered the competition of great moment, not only to the competitors, but to the poultry-keepers of the whole State. Further, the matter was already being discussed and followed with interest in the other States, and the results would be published throughout the wide world. It was their desire to make the competition a source of education to poultry-keepers, and to show the world the high standard the industry had attained here in the mother State of the Commonwealth.

Conditions.

The committee drew up the following conditions to govern the competition:—The competition was to commence on the 1st April, and extend over the period to 30th September, a period of six months calendar. The competitors were bound to pen their birds during March, each pen to consist of six pullets or hens of any age; no male bird to be included. All birds to be bred by the competitor. All birds to be examined by the Poultry Expert on arrival at the College, and any found to be suffering from infectious or contagious disease to be rejected. In the event of a bird dying, the competitor to be allowed to replace it. All eggs to become the property of the Department of Agriculture. The competition to be decided by the greatest total number of eggs laid by each pen. Eggs under 1½ oz. weight, or otherwise unmarketable, not to count. The market value of the eggs laid to be recorded. The weight of eggs from each pen to be recorded, and prizes given for the greatest aggregate weight. Records to be kept of the total quantities of the various foods consumed, and the average cost per head.

The following prizes were offered:—

The total number of eggs—

First prize, £10; second, £5; third, £4; fourth, £3; fifth, £2; sixth, £1.

The greatest aggregate weight—

First prize, £3; second, £2; third, £1.

In reference to the objects of the competition, the following appeared in the *Daily Telegraph* of 24th May, 1902:—"It has been

argued in some quarters that laying competitions do not attain their object, because they do not definitely settle the rival merits of various breeds of fowls. It has never been claimed by those interested in the competition now in progress at the Hawkesbury College, that, should Silver Wyandottes, for instance, head the list, they could be incontrovertibly proclaimed the best laying fowl. The competition has quite a different object. The aim of the promoters is to stimulate and encourage the laying branch of the poultry industry, and bring home to poultry-keepers the fact that, by devoting attention to this subject, they can get a relatively greater return from their birds. Do shows of pure-bred poultry decide which is the best bird for the table, for laying, or for general utility purposes? No; but by their direct and indirect influence, they improve the standard of the poultry of the whole community. Did the £50 which the Government expended in national prizes for poultry for export at the Sydney shows last year settle the question which was the best cross for export? No; but these prizes without doubt encouraged the breeding of a better class of table birds. What would be the standard of the poultry of the State to-day if there had been no shows? In the exhibition, form and colour alone count; even in the laying breeds, a hen may win a championship whether she has ever laid an egg or not. Exhibitions ignore—they cannot do otherwise the laying qualities of the fowls. The province of laying competitions is to improve the egg-producing standard of poultry."

To show that the production of eggs can be largely increased without any fear of glutting the market, it is not necessary to go further than the Customs returns for proof that there is one branch of the poultry industry in this State that is capable of great development, despite the remarkable strides that have been made in the exportation of poultry. The production of eggs in New South Wales has never yet equalled the consumption. This was one of the facts which the promoters of the laying competition had in view when the test was organised, to stimulate interest in and encourage the egg-producing branch of the industry. In 1901 the State imported 678,231 dozen eggs, value £23,560, and exported 41,135 dozen, value £1,609. Thus, an excess of £21,951 went out of the country for eggs. This is a fact which poultry-keepers will find worth considering; a fact which, through the lesson of the egg-laying competition, they are undoubtedly now very much considering, for already we hear of great preparations being made for increasing the egg-production by breeding up from proved layers.

Report of Committee.

The six months' test in connection with the *Daily Telegraph* laying competition, which was conducted at the Hawkesbury Agricultural College by Mr. D. S. Thompson, the Government Poultry Expert, closed on 30th September, 1902. The details afford many valuable comparisons. The competition has altogether exceeded the expectations of the promoters in exercising a widespread influence in stimulating the breeding of higher standard egg-producing fowls.

Even the majority of the competitors, who are among the most experienced poultry-keepers in the State, have learned much from it.

Three members of the Committee, Messrs. W. Harris, H. E. Kelly, and Mr. Dunnicliff, visited the College on the final day and checked the records.

The following were the prize-winners :—Greatest number of eggs—M. Ward, first, £10 ; A. E. Henry, second, £5 ; Grantham Poultry Farm, third, £4 ; G. Kennedy, fourth, £3 ; Bosanquet Bros., fifth, £2 ; W. H. Tombs, sixth, £1. Aggregate weight of eggs—M. Ward, first, £3 ; A. E. Henry, second, £2 ; W. H. Tombs, third, £1. The proprietors of the *Australian Hen* offered that journal for a year to the owners of the pens that averaged seventy eggs each per bird. The first eleven competitors secured the necessary number. The average results of the various breeds were :—

6 Imperials	426	eggs, averging	71·00
24 Silver Wyandottes	1,681	,, ,,	70·04
48 Black Orpingtons	3,127	,, ,,	65·14
30 Buff Orpingtons	1,949	,, ,,	64·96
18 Buff Wyandottes	1,145	,, ,,	63·61
30 White Leghorns	1,746	,, ,,	58·50
12 Anconas	672	,, ,,	56·00
6 Golden Wyandottes	317	,, ,,	52·83
6 "Birrilees"	317	,, ,,	52·83
18 White Wyandottes	848	,, ,,	47·11
6 White Orpingtons	273	,, ,,	45·50
12 Buff Leghorns	493	,, ,,	41·08
12 Andalusians	464	,, ,,	38·66
18 Minorcas	589	,, ,,	32·72
246 Hens totalled	14,047	,, ,,	57·10

The monthly laying was: April, 756 eggs; May, 1,090; June, 1,630; July, 2,839; August, 3,346; September, 4,386; grand total, 10,047; total weight, 1,855½ lb.

Mr. Thompson reports that the broodies gave great trouble during September. In a retrospect he says:—"The competition has been the largest of its kind ever conducted in any part of the world. The interest taken in the competition has been world-wide, and it has opened the minds of conservative people to the importance of the poultry industry, and will lead to more consideration being given to the egg-producing branch than it has received in the past from the Government and the people.

"The laying right through has been regarded by competent critics as excellent. The number of pens in this contest has been much more numerous than in any other competition in the world, and consequently our gross average laying would be less, but in comparison with any other competition, taking an equal number of pens, we do not suffer. On the contrary, taking our first 20 pens, and comparing them with the 20 pens run in the latest English competition, we come out considerably to the good, while our first and second pens beat their first and second pens in averages for a corresponding period.

"The quantity of food served to each pen consisted of one pint of bran and pollard mash in the morning, mixed with liver soup, green

food at mid-day, and one pint of grain at night. The feed cost on the average 1d. per pen per day for the staple foods, besides the meat and shell grit, which we give in the total. The cost for the six months has been:—Staple foods (grain, bran, and pollard), £31 17s.; meat, £2 12s.; shell grit, 7s. 6d.; total, £34 16s. 6d. The market value of the eggs laid was £83 13s. 11d., thus showing a profit of £48 17s. 5d. for the six months."

The average value of the eggs was 6s. 5d. per hen, and the cost of feeding, 2s. 9d., leaving a profit of 3s. 8d. each. Mr. Ward's black Orpingtons thus gave a profit of 9s. 1d. each. Only one pen failed to pay for its feed.

All the pens but those of Messrs. E. Clifford, J. Hunt, and H. Cadell have been re-entered for the full year's test.

The appended table gives full details of the laying and the value and weight of eggs from each pen of six birds. The value has been calculated on the basis of the eggs laid each week and the prices obtained for best new-laid eggs at the auction sales in Sydney each Friday. The age given is the average of the six birds at the commencement of the competition:—

Owner, Address, and Breed	Age Months	Eggs Laid							Weight per dozen	Total weight	Market Value
		April.	May.	June	July	August	September	Total			
M. Ward, Gosford — Black Orpingtons	7½	24	82	85	124	118	115	548	26	74	71/
A. E. Henry, Ryde — Silver Wyandottes	11	31	74	101	106	100	107	519	23½	63¾	68/9
Grantham P. Farm, Plumpton — R. C. White Leghorns ..	8	58	69	49	56	102	136	470	24	58¾	61/1
G. Kennedy, Picton — White Leghorns ..	13	45	36	60	100	107	121	469	24¼	59½	58/
Bosanquet Bros., Liverpool — Buff Orpingtons ..	18	58	44	52	108	98	91	451	24	56½	58/3
W. H. Tombs, Penrith — Anconas	12	18	66	80	72	105	103	444	26	60	57/4
J. F. Brown, Epping — Silver Wyandottes	10	31	59	66	82	104	101	443	24	55½	57/1
E. Waldron, Willoughby — Black Orpingtons	7½	17	67	66	81	97	114	442	24	55¼	57/1
Mrs. G. D. Cheshire, Tempe — Black Orpingtons	7	29	36	69	117	99	81	431	24	54	56/5
Mrs. H. Bastin, Enfield — Black Orpingtons	17	32	30	85	105	50	128	430	24½	55	54/6
W. E. Boutcher, Canterbury — Imperials ..	6½	27	84	49	74	116	76	426	24	53¼	57/2
J. E. Pemell, Randwick — Buff Wyandottes	10	25	38	51	78	107	119	418	24	52¼	49/9
F. Greenwell, Mittagong — Buff Orpingtons ..	11	27	38	49	102	90	108	414	24	51¾	51/1
J. J. Roche, Bayview — Black Orpingtons ..	9	2	23	59	110	103	111	408	25	53	48/3

LIST of Competitors—*continued.*

Owner, Address, and Breed.	Age Months	Eggs Laid							Weight per dozen	Total weight.	Market Value.
		April	May	June	July.	August	September	Total.			
E. Clifford, Hurstville— Buff Wyandottes ..	12	27	33	51	81	106	97	395	26	53½	48/
H. J. Braithwaite, Luddenham — Silver Wyandottes	7	60	53	87	75	53	66	394	23¾	48¾	55/1
Maxwell and Neate, East Hills— Black Orpingtons	7	17	42	88	67	81	99	394	24¾	50¾	50/6
J. D. Callaghan, Homebush Buff Orpingtons	12½	41	5	40	80	110	106	382	26	51¾	44/2
E. J. Davies, Chatswood— White Wyandottes .	8	44	52	44	56	80	101	377	25	49	48/9
J. Hunt, Marsfield— Buff Orpingtons . ..	22	0	4	51	94	106	119	374	25	48¾	42/9
W. H. Peters, Islington— Buff Wyandottes	6½	1	0	22	94	107	108	332	24	41½	35/9
H. E. Kelly, Ashfield— Buff Orpingtons .	6	14	13	53	99	64	85	328	26	44½	39/9
J. Young, Burwood Silver Wyandottes .	19	9	12	35	79	84	106	325	28	47½	37/
A. Hallen, Toongabbie— Golden Wyandottes .	7	12	0	38	35	100	114	317	24	39½	35/8
D. Scott, Burrilee Burrilees	7½	0	18	34	54	81	130	317	24	39½	34/5
A. Munro, Bonnyrigg— Buff Leghorns . ..	11	17	18	26	67	80	98	306	24½	39½	35/6
W. Haydon, Hurstville— White Leghorns ..	7	7	17	22	83	70	94	293	30	45¾	33/6
C. K. Horwood, Wagga White Leghorns	7	11	20	23	47	71	112	284	29	43	31/6
W. F. Evenden, Kogarah— Andalusians .. .	26	1	0	21	66	68	122	278	30	43½	29/
S. G. Small, Marsfield— White Orpingtons ..	10	2	2	19	61	73	116	273	27	38½	28/9
W. B. Bull, Summer-hill— White Wyandottes	12	21	10	3	56	52	129	271	24	34	29/4
Dr. Fiaschi, Sackville — Black Orpingtons ..	6½	0	0	0	71	68	119	258	26	34¾	25/8
Mrs. A. Hislop, Plumpton— White Leghorns ..	19	3	0	0	3	103	121	230	30	36	21/
G. Hemsley, Moss Vale — Anconas	11	1	1	13	28	83	102	228	26	31	22/8
H. Cadell, Beecroft— Minorcas	18	1	1	4	56	37	127	226	30	35¼	22/7
W. C. Freeman, Randwick— Minorcas	6½	1	6	21	47	24	104	203	26	27½	21/1
L. L. Ramsay, Carlingford— Black Orpingtons ...	17	18	8	5	47	61	77	216	24	27	24/
W. Harris, Woy Woy— White Wyandottes ...	5½	16	3	0	20	54	107	200	24	25	19/9
Mrs. T. Milsop, Arncliffe— Buff Leghorns	20	8	21	1	6	71	80	187	26	25¼	19/6
Mrs. J. Burke, Singleton— Andalusians	5½	0	0	7	30	30	119	186	30	29	18/
E. J. Winton, Campbelltown— Minorcas	6	0	5	1	4	33	117	160	28	23¼	14/6

General Retrospect.

The competition has attracted hundreds of interested visitors to the College from all parts of New South Wales and the other States. To the students it has been an ever-present and the best possible object lesson on utility poultry-keeping, and the results have been closely followed throughout. It would be difficult to over-estimate its value in this respect, just as it would be to overrate its influence in awakening the generality of poultry-keepers to the fact that efforts to work up strains of fowls that will give double the results in eggs on the same amount of feed will handsomely repay them. Here we have had forty-one of the most experienced breeders in the State, each of whom considered his birds *par excellence* as layers, but the majority of them have found, in open competition on equal conditions with others, that they were far from being at the top of the tree. Naturally, these breeders will put forth every effort to attain the highest standard. It is obvious, therefore, what an education the competition must have been to the average poultry-keeper, who has been prone to regard a hen as a hen, quite irrespective of her productiveness. This competition has only been the beginning, and like all new ventures it is open to improvement in detail, viewed in the light of experience. With the lessons learned, it is only reasonable to assume that future contests will be increasingly helpful to the great industry which they are intended to foster.

Another Competition.

The Minister for Agriculture has approved of another competition, to be organised by the *Daily Telegraph*, being commenced at the Hawkesbury College, upon the conclusion of the one now in progress. Messrs. W. S. Campbell, H. W. Potts, and D. S. Thompson will represent the Department of Agriculture on the Committee of Management. It is expected that over £100 will be available as prize money, the *Daily Telegraph* having initiated a fund for that purpose with a donation of £50. To increase the educational value of the test a challenge has been sent to America to breeders there to send three pens of fowls to compete, and Mr. W. Harris, a member of the committee, has forwarded a guarantee to pay the whole cost of shipping the birds to Sydney, probably amounting to £25 or £30. The competition will extend over a full year, and will be restricted to pullets. Already the arrangements are well in hand, and 92 applications, representing 66 districts, have been received from various parts of the State. The Minister for Agriculture has under consideration a request from the committee that the present 42 pens be increased to 70, to permit of all the districts being represented. In this way the competitors will be widely scattered, and the interest and educational influence will be correspondingly distributed.

BUTTER-MAKING.*

BY P. H. SUTER.
Dairy Instructor at the Hawkesbury Agricultural College.

As flavour is the most essential point in determining whether butter is deserving of the term choicest (and consequently higher rates) or whether it is to be termed pastry (or lowest rates), it must necessarily be of first importance that the manager of any factory has some control over the manner in which the milk he has to work upon is handled and cared for by his suppliers. He should see that cleanliness is observed, for the tendency of suppliers is to treat this necessity too lightly.

He should teach them the Dairyman's Sixth Commandment, which runs thus:—

"Thou shalt be clean, for lo! it standeth as an everlasting truth
That Cleanliness is next to Godliness;
And if you keep your byres clean,
And thy milking vessels thoroughly washed and scalded,
And everything about thee neat and clean,
It shall become a mark of distinction unto thee,
And thou shalt be favoured before other suppliers,
And will increase in possessions and honour."

If any abnormal milks are delivered to the factory you would naturally reject them; but I would ask you to follow this up, and do all in your power to assist your suppliers, whenever you can, and not only confine yourself to milk which may be faulty on account of, possibly:—

Bad water;	Filthy utensils;
Unsuitable feed;	Unhealthy cows, &c.;
Filthy milking;	Milking from newly-calved cows;

but post yourself up in remedies for the ailments likely to befall the dairyman's cow, and assist him by applying the remedy.

The reason why cleanliness is so essential is because germs or micro-organisms of an undesirable kind gain access to the milk and bring about fermentations which develop undesirable flavours peculiar to their kind, consequently depriving the best butter-maker from producing the best-flavoured and keeping butters. Some advise grooming of cows and the rejection of the first few streams of milk. I admit this to be good, but never expect to see it carried out practically; but what I do ask is that cow-dung and dirt be removed from the udder of the cow by washing with water and sponge, and milking with clean hands, or in other words use reasonable precautions against the entrance of filth to your milk in every particular up to the delivery of the milk to the factory.

* Paper read before Conference of Factory Managers, Sydney, July, 1902. Mr. Suter was formerly Manager of the Mortlake, Cowwarn, and Boisdale Butter and Cheese Factory Companies in Victoria.

When the dairyman has delivered to the factory a good, sound, sweet, well-cared-for milk, I consider he has fulfilled his responsibilities which are great in the manufacture of the best butters, and he is free of the blame too often unjustly placed upon his shoulders, and thence onward all responsibility remains with the factory manager. The milk now being received at the factory is weighed or measured, sample taken, which it is important should be proportionate to the supply. The temperature of milk is raised to separating temperature, say 86° to 90 F. Cream is run over a cooler which both aerates and cools it down to say 58° to 65° F.—the ripening temperature. This cooling of the cream is the block over which many butter-makers stumble, and it is very important. Reason:—the cooling firms the fat globules, and consequently has a good effect upon the grain and texture of the butter.

Cream should now be removed to cream vats or cans, and then into the ripening room to mature, either by addition of starters or naturally. This room must be scrupulously clean, and well lighted and ventilated, and temperature to 62° F. The cream should be stirred at intervals to get even ripening, &c., and ripening should be allowed to continue till an acidity of ·56 to ·66 percentage of lactic acid is present (or, in other words, proper souring of your cream). Reason:—Because properly ripened cream produces butter of—

Better keeping qualities;
Better flavour;
The cream will churn sooner;
You will realise better returns from the cream; and
There will be less loss of fat in the butter-milk.

As against insufficiently ripened cream which results in—

Poorer keeping qualities;	Longer churning; and
Poorer flavour;	Greater loss of fat in butter-milk.
Poorer return from cream;	

The cream having the necessary amount of acidity present, viz., ·56 to ·66, it should now be reduced to churning temperature, and churned at about 51° F. in summer, and 58° in winter.

The conditions which govern churning of cream are:—

Temperature;	Consistency of cream; and
Acidity;	Quantity of cream.
Speed of churn;	

If your butter does not come in from 20 to 35 minutes, either of the following may be the cause of delay:—

Insufficient acidity;	Too low a temperature;
Insufficient speed;	Too much cream in churn.

When about to churn add the colour to your cream; and it is well to strain it, adding sufficient to suit your market. Then run the churn (if concussion) at rate of forty to forty-five revolutions per minute for a minute or two, and allow gas to escape which developed during the ripening, the churning continuing till the butter breaks or, as generally termed, "comes"; or, in other words, till the fat

globules coalesce, and are the size of small grains of wheat, when a small quantity of water, at the churning temperature of the cream, should be added, but not higher, nor yet at too low a temperature; because, by adding water at the stage butter comes, it assists very much in the removal of the casein, which if left in butter, in the shape of butter-milk, forms the necessary food for germs to feed upon and bring about decomposition.

The water is put in at churning temperature because, if higher, it would cause the butter to be of a soft and greasy nature, spoiling the grain, and butter will not stand as much working on the table.

The water should not be put in churn at too low a temperature, because it makes the granules of butter too firm and hard on the outer edges, and consequently more difficult to work; further salt cannot be so uniformly worked into the butter, resulting in streakiness, and often mottles.

Give your churn a few revolutions until the granules of butter are the size of wheat, run off the butter-milk, and pump to the tanks. Now add sufficient good water (preferably filtered) until you float the butter, the temperature being the same as the churning temperature of your cream. Now run your churn again until the granules are the size of boiled rice. Next run off the water, which should come away fairly clean and not too cloudy. If clear, it shows the almost complete removal of the casein and albumen. If it be very cloudy, wash again; but too much cold or other water, should not be used in washing butter. The cold water has the effect of dissipating the flavouring agents, thus robbing the butter of its natural aroma, which must accompany best butters.

When completely churned, allow the water to drain away, then weigh out the butter on to the worker, in order that you can come something near uniformity of salting. I know in many places it is never weighed, and have done it this way myself with good results, but nevertheless you cannot salt uniformly.

The butter after being placed on the worker should be worked just sufficient, probably one or two turns of worker will expel the surplus water, when it should be ready for the addition of the salt, which should be the best, and the best is none too good. You should add it in such quantities most suitable to your market, usually 3 per cent. to $3\frac{1}{2}$ per cent. of salt and $\frac{1}{4}$ per cent. to $\frac{1}{2}$ per cent. of preservative when required for oversea markets.

Salt added for flavouring—

Acts as a drainer of the surplus moisture;
Intensifies colour;
And, to an extent, increases the keeping qualities.

The salt should be added to butter at about the same temperature as the butter, and it should be kept in a suitable and clean place; for, it must be remembered, germs of an undesirable nature grow vigorously in salt. Salt should be added to butter containing a medium percentage of moisture.

If salt is put into butter when the butter is dry and the salt fine, the salt works out and forms a crust due to insufficient moisture, for

the salt to bring about its own solution. If the butter be too moist when salt is added, the water in the butter will dissolve the salt and form brine, and it will thus be worked out on the second working. Thus moist butters require more salt than the drier butters.

If you use a very coarse-grained salt, you are almost sure to be troubled with streakiness, due to the large crystals taking some time to dissolve, not dissolving during the operation of working your butter; and if not re-worked, it must result in streakiness.

If you are working your butter up for local markets, one good working should be sufficient in order to bring about uniform salting. If you intend your butter for London or foreign markets, I would advise working the salt in the first working, but not as much as you would for local butter; then place it aside on your butter-table or trucks in a room, at a temperature of from 56° to 60° F., for about twelve hours, or until the following morning, and then re-work it, thus having allowed the salt to do its work, and one or two revolutions of the worker should be sufficient to guarantee your butter against streakiness. Of course, the proper working of butter can only be gained by experience and by no rule-of-thumb business; but I found, by attention to the above details, no complaint ever arose in either London, Australian, or Eastern markets.

If you place your butter overnight at too low a temperature, you will experience trouble in getting it under the rollers, due to it being too firm, and if the butter is jammed under the rollers the grain will be damaged. The temperature of the butter-working room should not exceed 60° F.

Packing.

This is very important, and should receive the careful attention of managers. The cases should be made from thoroughly-seasoned timber, for, if green, it will cause mouldiness on the sides of the butter.

The weight of cases should not be too great—say, not exceeding 12 lb. They should not be too big, allowing too much space between butter and lid. The wood should not be discoloured or knotty, but nice and clean. They should be aired overnight, by removing the lid. I found steaming them (but not the lid) drove off woody smell, which must affect the butter. When preparing them for butter, paper them with good stout butter-paper, having previously run your paper through a solution of salt and preservative, and see that you leave no wrinkles, which will give your butter the appearance of bad packing when stripped, and see all portions of box are papered. Then weigh them and place bare at corners of case. When placing butter in box do not put too much in at once, but (say) about 8 or 10 lb., and thoroughly ram it and see no air-spaces remain in corners, and thus leave air-holes to assist decomposition.

Having filled your case in this way, place same on your scales, which should be carefully adjusted daily; then with your wooden scraper smooth over the surface of your butter, leaving 56½ lb. in for export and 56 lb. net full for local market, and be very careful over the

weights, for this is the cause of much trouble to your agents, and will recoil on you if you sell 55 or 55½ lb. of butter in a case with "56 lb. net" branded upon it, and buyers will shy-off your brand. Make a level surface on the butter, then impress your company's brand or trade-mark neatly upon it, pare-off all edges of butter, and draw up neatly your side-papers, making them meet squarely in the centre. Then fold over your end-papers on top, and nail on a neat-fitting lid, wipe bottoms of your cases, and place away in the cool room at as cold a temperature as you can secure, the lower the better, until ready to forward to the agents or Freezing Works to be exported.

When finished, your package of butter should present a neat, clean, and attractive appearance; for, remember, if you are to get best results, it is highly important that you cater as well for the eye as the palate of the English buyers.

Hawkesbury District Farm Notes—November.

By H. W. POTTS.

The busy month of October is now over, and those farmers who were not disheartened with drought conditions have reason to congratulate themselves by getting in early summer crops. Rain has fallen on four occasions since September, supplying a total moisture of 4 inches. Shortage for winter feed is yet before us, and demands that strenuous efforts are made throughout this month to meet this failure, apart from the usual conditions which make November the busiest period in the year. Late planting and sowing is in full operation; moreover, the necessity for active attention to the growing crops is constantly present.

Hay Crops.

It is not usually considered good farm practice to convert the first growth of the lucerne crop in the season into hay, but scarcity of stock and other conditions this season, such as market values, suggest a departure, and hay-making seems the most profitable. The rule is to commence cutting the crop when showing one-third in bloom. In some instances the winter-sown crops—oats, wheat, and barley—are so short that stock have to be turned in to eat them down. In the majority of cases the crops will be very light, and they will be rapidly harvested as hay crops this month.

Maize.

All the early crops now demand attention. They are above ground in the full strength of vigorous growth. The aim of the farmer should be to stimulate and maintain it up to full maturity by constant cultivation. Harrowing or scuffling after every shower should be practised. This prevents the ground caking, conserves moisture, and keeps the weeds in check, as well as acts as a hindrance to the usual night-feeding of caterpillars. This season we have been visited by a plague

of beetles in the soil, which are eating out the seed-corn and tender rootlets. Mr. Froggatt is engaged on an investigation of this pest. In many instances the corn has to be replanted owing to the depredations of these unwelcome boarders.

The soil is in a most favourable state for suitable tillage, and further crops may again be sown with advantage, not omitting the much-required ensilage varieties for next winter's feed. Those most favoured in this district are the Hickory King and Hawkesbury Champion. Shallow cultivation for early crops may yet be practised.

Sorghum.

The ground is warm and moist, and presents the best conditions for planting sorghum this month to secure an early and certain germination of the seed. Early Amber cane and Black Sorghum are the best varieties to plant. The former variety sown fairly thick will serve to act as a forage crop. In the absence of winter hay, a contingency which presents itself in a serious light this season, our farm foreman, Mr. Cobb, suggests that sorghum acts as a splendid substitute. Cut and bundle it just when the flower falls, and give it plenty of field room to dry. Mr. Cobb recalls a similar experience many years ago in South Australia to the one we are going through here. This plan was adopted with excellent results. The winter following, the horses were fed on this feed throughout.

Millets

May still be planted. Hungarian is the most suitable for hay, and Pearl Millet for quickly growing green feed. With Broom Corn the crops above ground would be better for thinning when a few inches high. The plants mature better, and a freer and sturdier growth is encouraged. The process is tedious; but the results amply repay the cost.

Pumpkins and Melons.

Some of the earlier-sown crops are being attacked by insects. Sprinkling bone-dust over the hills is said to be effective in driving them off. The dual advantage in applying this remedy is its manurial gain as well as the insecticidal action. Further crops of these plants may be sown this month. It is one of the useful "stand-bys," especially when feed is scarce, both to the pig-raisers as well as the dairy farmers. A continuous growth of succulent fodder is provided. The early stages of growth may be advanced by cultivation. A thorough stirring of the soil is wanted also to keep down weeds. An effort is being made this season to resuscitate the old variety of Ironbark pumpkin—a really useful sort in such seasons as the present.

Potatoes.

No crop responds more readily to cultivation than the potato. A sturdy growth is essential to enable the plant to resist the ever-recurring attacks of insects and fungoid pests.

E

Sweet Potatoes.

The plants of this valuable vegetable and fodder plant can still be put out. The shoots are very tenacious and hardy. They resist heat and drought exceptionally well when planted deeply. It is quite sufficient to have the tips showing above ground.

Sunflowers.

Poultry-farmers located in districts comparatively free from sparrows should grow a small plot of sunflowers. They are rapid growers, require little attention, and furnish a nutritious and valuable feed, especially for show birds, as evidenced in the fine gloss imparted to the feathers. The stocks may be utilised as fuel.

Cow Pea and Soy Bean.

Full plantings of these excellent forage crops may now be made with safety. They deserve greater attentions than have been given to them in the past. Their importance and usefulness as fodders, as well as soil-renovators, require to be more extensively known and appreciated. Early maturing varieties should be selected for planting this month.

Lima and French Beans.

Field crops of these can be sown extensively and with safety this month.

Mangolds and Sugar Beets.

Late crops should be more thickly sown than the early ones. The young crops should be thinned out, the ground kept well stirred and free from weeds, and a top-dressing applied of small quantities of sulphide of ammonia and kainit.

Bot Fly.

The season is approaching for the appearance of the Bot Fly, and it is advisable to give the horses a drench two or three times in succession, with a week between each, of 2 oz. turpentine in a pint of raw linseed oil.

Farm Notes.

WAGGA.—November.

G. M. McKEOWN.

As the hot weather will have fairly set in, and the season is unprecedently dry, nothing can be done in sowing except in very favoured situations where water is available. The work of the season will, therefore, chiefly consist of harvesting cereals for hay or grain.

Wheat for Hay

Should be cut when just flowering, as when cut at this stage hay is far more palatable and more easily digested, besides containing more nutrient matter than is the case when allowed to ripen before cutting. It should not be allowed to lie in the field longer than is absolutely necessary to cure it, as its quality is improved by stacking as early as it is safe to do so. For the Sydney market a bright green colour is essential, and if cut into coarse chaff, about half an inch in length, it will always command the highest prices.

Wheat for Grain.

The present disastrous drought will probably draw attention to the desirability of cutting the whole crop and saving all the straw and "cocky chaff" for fodder instead of burning it off after stripping, as is too frequently the case. The feeding value of straw, which has been cut and stacked before threshing, will be found superior to that which has been allowed to ripen for shipping and then to bleach in the sun.

Oats

For hay should be cut when the first few husks at the top of the heads are changing colour, the grain then being well formed. As in the case of wheat, the crop should be promptly cut and carefully saved in the field and stacked so as to retain as far as possible its green colour.

Maize and Sorghum,

While in their younger stages, should be cultivated with a light harrow, and as the plant grows larger the horse-hoe should be used between the rows. Light cultivation only will be necessary.

Pumpkins, Melons, and Squashes.

The spaces between the plants, where possible, should be cultivated by means of light harrows or horse-hoes, the soil in the immediate neighbourhood of the roots of the plants being well mulched with rotted stable manure or other suitable matter. Water should be applied where available by a thorough saturation of the soil under the mulched portion.

BATHURST FARM NOTES—NOVEMBER.

R. W. PEACOCK.

Maize.

IF this crop is not already planted, it should be without delay, especially for grain, as in this district the season is too short to allow of late sowings maturing, excepting with very quick-growing varieties. It can be sown largely for green fodder and for ensilage. More attention should be given to it in this respect, as it makes excellent sweet fodder for dairy cows, and adapts itself to numberless conditions.

Sorghums and Millets.

The many varieties should receive attention, and if the drought were to break during the summer and autumn, the heavy yields obtainable from such crops would compensate somewhat for the scarcity of the other cereals.

Cow-peas

Can still be sown, and are valuable for fodder and green manuring.

Pumpkins

Can also be planted for household use and cattle food, but sowing should not be deferred past the middle of the month.

Cultivation.

All crops already up will need frequent cultivations with hand or horse hoes to kill weeds, and also to conserve the very limited moisture. The loose soil, formed by so doing, acts as a soil mulch, and goes far to ensure payable results.

Hay-making.

The first cut of lucerne should by this be harvested, and should have been cut about the time the first blooms appeared. The early wheat and oat crops, sown for hay, will be ready to cut this month, and care should be taken to provide stack-bottoms, in the shape of old rails, bushes, or some litter, to keep the stacks off the ground, as no farmer can afford to lose the first foot of his stack by the damp striking up from the soil, upon which it is too often placed without any provision of prevention. The most economical way of gathering the cereal crops for hay is to cut with a string binder, but care should be taken to allow it plenty of field room, or otherwise when stacked in large stacks it is liable to heat, and thus spoil, especially at the bands of the sheaves. The sheaves should be made small, and put into small stooks. The hay is fit to stack when that in the middle of the sheaves breaks when twisted short. It requires from two to three weeks in the field, excepting under very drying conditions. If mown and raked, it requires much less field room, and can, in good hay-making weather, be stacked within a week from cutting. The crop should be cut when full grown, and not allowed to lose colour at the bottom, and should be cut rather to ensure colour than a proportion of grain. The hay cut on the green side is more wholly digested, and therefore more valuable, than that left till more fully matured.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

As the rainfall this year has been much below the average it will be necessary for growers to use every effort to conserve all the moisture possible, which can be best done by stirring the ground after rain as well as giving it an occasional cultivation, in order to keep down the weeds and to keep the soil in fine tilth. On no account should the soil be ploughed during the hot months, as this turns up the moist soil which when exposed to the sun loses its moisture, which under existing conditions it is our object to conserve, particularly at this time of year. Weeds also pump out moisture from the soil which it can ill afford to lose, therefore under no circumstances should they be allowed to find a place in the orchard, but should be kept down by a thorough system of cultivation.

As this year has been such a dry one it will be well this season to thin the fruit a little more than is necessary during an ordinary season, as owing to a lack of moisture in the subsoil it will be found that the trees will be unable to mature the same quantity of fruit as during a normal season, particularly after the drought of last year, which had to a certain degree weakened them. Therefore, if trees have not been cut back heavily at time of pruning, see that thinning is carried out, and err on the right side by doing this work so that too much fruit will not be allowed to remain on the tree, when the chances are that what is allowed to remain will be of good quality and find ready sale at remunerative prices.

Summer pruning may be started this month, and it is well to go over and regulate the growth in all young trees, thinning and shortening back where required—that is where the tree is growing too thick, and pruning or pinching back so as to keep the tree evenly balanced and symmetrical. This early summer pruning is more for young trees, to aid in directing the growth to that part of the tree where it is most required. December and January are the months for summer pruning the older trees in order to force out fruit spurs and buds.

In districts where the fruit-fly has been troublesome in previous seasons, I would recommend growers to be particularly careful in picking up and destroying all fallen and fly-infested fruits and boiling them, in order to ensure the destruction of all larvæ which may be contained therein. As this is the only sure way at present known of helping to keep down this pest I would urge on growers the importance of doing their best to destroy these larvæ.

Keep a close watch on all newly-planted trees, and if they show signs of distress make a small basin around the tree and at a distance of at least a foot away, and give the tree at least two buckets of water; but do not allow this to come in direct contact with the trunk of the tree. In making this basin a little soil may be put around the trunk so as to keep the water away. As soon as the soil is dry enough, and before it cakes, have the basin lightly fork-hoed and filled in.

Where irrigation is practised a thorough watering should be given all trees towards the end of the month. This should be the second watering of the season. Be most careful to keep the water confined to the furrows, as wherever the land is flooded it is liable to become hard. As soon as the furrows are dry enough to work, cultivate the orchard twice and loosen around any young trees with a fork-hoe.

Every care should be taken to destroy the codlin moth which makes its appearance about the time the apples finish blooming, lays its eggs on the young fruit and leaves, and, after hatching, works its way into the apple, and within a few weeks emerges and lowers itself down to the ground by a silken thread, and immediately seeks shelter by crawling up the tree and getting into any crack or underneath any old loose bark, either on the tree, on props, or any loose rubbish which will provide a hiding place. The orchard should, therefore, be kept free of such rubbish and all trees bandaged at a height of about 18 inches from the ground. The grubs will harbour in the bandages, and these therefore should be removed every ten days and all grubs killed. Pick up and destroy all fallen fruit.

Pruning of citrus trees may be continued wherever not completed.

Wherever Thorny mandarins show signs of cropping too heavily it will be well to prune them a little more heavily as well as removing some of the fruit from the tree so that the latter will not overbear and exhaust itself this season. If allowed to overbear the fruit will be small and almost worthless.

Budding of citrus trees may still be carried on.

All citrus trees attacked by Maori or fungus diseases should be sprayed with Bordeaux mixture.

Towards the end of the month fumigating for red and other scales may be carried out.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of November.

Vegetables.

UNLESS the weather is showery during this month, and if water is scarce, vegetable growing is not likely to prove satisfactory, except in those districts where the ground had already been thoroughly well saturated. The use of abundant dressings or applications of farmyard manure and the deep cultivation of the ground are strongly recommended, for this will be found to preserve moisture in the soil better than anything else. Should the weather prove satisfactory, and good showers of rain fall from time to time, vegetables of many kinds are likely to succeed well. Cucumbers, melons, vegetable marrows, pumpkins, and all vegetables belonging to the same natural order, are likely to make most satisfactory growth during the month, should occasional rains fall. In windy places, it would be advisable to peg down their strong growths, or the plants may be greatly injured, unless the shelter of maize, Jerusalem artichoke, or else, perhaps, something permanent can be provided to break the force of the prevailing summer winds, and especially lessen the effect of hot winds, which are likely to visit us at any time.

Asparagus.—The shoots of this vegetable may still be had in the cool districts, if all are gathered as soon as they are suitable for cutting; but judgment must be used, to avoid interfering too much with the growth of the plants and their probable deterioration. The young plants should be growing satisfactorily by this time. If it is found that the plants are blown about much by strong winds, they would be all the better for the support of stakes, or something to protect them. The need for prevention of injury by winds is generally overlooked; but timely attention is advisable.

Beans—French, Lima, Snake, Scarlet-runners, and Butter may all be sown if required, for any of these tender legumes should succeed quite satisfactorily during this month, and also during the remainder of the summer, provided they can obtain a sufficiency of moisture. Any of these beans may have their bearing or producing period prolonged, if every bean pod is gathered before it matures its seed. And this is the case with other annual vegetables, such as the pea and broad bean. The great effort of the plant, its main object, after arriving at a certain stage of growth, is the production of seed, and should its efforts be interfered with, such as the removal of immature seeds, it will renew its efforts to produce more. Should any seeds be allowed to mature (they need not become what is known as quite ripe) the work of the plant has been completed, and no further efforts to assure reproduction are necessary.

Beet, red.—Seed may be sown from time to time during the month, in order to keep up a continuous supply. The best variety of beet that I have seen is the globe-shaped kind, known as Combination. It is remarkably dark in colour, both foliage and root, and presents quite an ornamental appearance when growing. The globe-shaped red beets seem to be much liked, and will probably be grown, in course of time, in preference to the long-rooted varieties. If the soil is dry, the seed is likely to remain dormant until rain comes or water is applied to saturate the soil. When the plants come up and are strong, thin them out to about 8 inches apart in the rows.

Silver beet.—This is a good useful vegetable for the summer; but, like all vegetables which are grown for their succulent leaves, it needs a good deal of moisture. When preparing land for this beet, apply a heavy dressing of rich farmyard manure. Sow or plant in rows about 20 inches apart. The plants should stand about 18 inches apart in the rows.

Broccoli.—In the quite cool districts a little seed might be sown occasionally, and when the seedlings are large enough to move they had better be pricked out 4 or 5 inches or so apart. Afterwards they should be shifted again to good, rich, well-manured ground, and planted out about from 3 to 4 feet apart. During the moving operations as little damage as possible to the roots should be caused.

Cabbage.—A few young cabbages should be planted occasionally from the bed where they have been already pricked out. Sow a few more seeds. There is no necessity to sow much more than will be necessary to provide enough cabbages for successional planting, allowing for some loss. The variety called Succession is an excellent one. Another named Phenomenal is also a superb variety. I sent a few seeds to Mr. T. F. Ellis, Superintendent of the Howlong Viticultural Station, last season, and the cabbages he raised there have been splendid. He says, "As I have raised and given a trial to two separate batches from the same packet of seed, the first batch of which you saw; the second lot has also proved to be first-class. I am sowing some of the first for seed, and I hope to have a good lot from them. It is an ideal cabbage, and I do not think it possible to produce a better." Plant out any good seedlings of cabbage which may be ready, and take the precaution to use abundance of manure.

Carrot.—Sow a little seed in drills about from 12 to 18 inches apart. The soil should be deeply and well dug; but it would not be advisable to add manure for this vegetable.

Cauliflower.—A little seed may be sown in seed-bed, or box. A good deal of care will be necessary to raise, successfully, young cauliflower plants during the summer. Attention to watering the seed-bed regularly, and to proper shading, so that the soil does not become dry, are very necessary.

Celery.—Any well-grown plants may be earthed up or blanched by the use of boards or anything that will keep out the light from the stems. It is desirable to so earth them up or cover them that rain or wet may not have access to the stems. Plant out from the seed-bed a few plants occasionally to keep the supply going, but unless plenty of

water is available, it will be little use trying to grow celery, except a few plants perhaps for use in soups, stews, and other made dishes. Sow a little seed if any more plants are likely to be required, and prick out into small beds when large enough to shift.

Cucumber.—Sow a few seeds where a sufficient supply of plants have not yet been raised. Pinch the leading shoots of plants already growing, and if necessary supply with good quantities of water.

Cress and Mustard.—Most useful, quick growing salad plants, as easy to raise from seed probably as any plants cultivated. They need a good deal of moisture, but a very small patch at a time should give a satisfactory return, and may suffice for an ordinary sized family.

Capsicum or *Chili*, sometimes known as Pepper.—A few plants only need be grown unless for experiment or ornament, for some of the variety such as Celestial are very pretty when covered with the various-coloured fruits. Some of the large-fruited mild varieties, which are said to be the best kinds for the use of canaries, are quite handsome with their brilliant-coloured fruits. Sow a pinch or two of seed.

Egg Plant.—Not much used in this State as a vegetable. A few fine fruits are occasionally imported from New Caledonia, but they could be grown here just as well as in that country. There are many varieties, some with white, others with striped, some bright scarlet, and others again with purple fruits, but the merits of these for vegetable purposes are much the same. Sow the seed in a box or flower-pot, or in seed bed, and transplant in well-manured land. Set the seedlings about 3 or 4 feet apart.

Khol Rabi.—Useful for stock, and occasionally used and liked by some persons as a vegetable. Sow seed, transplant, and manage just as you would for cabbage, but the plants need not be planted quite so far apart, if to be used as a vegetable, for they had better be cut when rather small and tender.

Leek.—A few leeks will be found useful for a change vegetable; and for many kitchen uses. Seed may be sown from time to time in box or seed bed, to keep up a supply of young leeks for planting out. Any leeks already raised should be planted out in trenches made from 4 to 6 inches deep. There is no real necessity for planting in trenches, but as the leek needs a great deal of moisture during its growth, and is benefited by applications of water and liquid manure, the shallow trenches will be found convenient. Before planting dig the soil well and apply manure heavily.

Lettuce.—As the summer advances, it will be found that sowing the seeds where the plants are to grow is the best plan to adopt, for in this way the lettuces are not so liable to run to seed without making hearts, as transplanted lettuces very frequently do. Sow them in rows, and when the seedlings are strong, thin out. Use abundance of well-rotted manure, and encourage growth by the application of liquid manure if there should be any indications of check to growth.

Melons of Kinds.—Seeds may be sown extensively, as after the land has been well manured, not in holes, as is sometimes the practice, but throughout.

Okra.—This is a vegetable not much used, but useful for some purposes, and worth growing. The seed pods, when green, make good thickening for soups and various dishes. Sow a few seeds in box, pot, or seed-bed, and transplant when the seedlings are an inch or two in height 2 or 3 feet apart, in rather rich soil.

Onion.—Sow a little seed, and attend to onions which are making progress; keep down the weeds, and cultivate between the plants frequently.

Parsnip.—Sow a little seed in rows 2 feet apart. The soil should be deeply dug for this vegetable, and no manure should be applied directly; but it should grow well on land that had been heavily manured for cabbage, cauliflower, or some such crop. The parsnip takes a long time to come to maturity, but is worth growing, for it is a wholesome vegetable.

Peas.—Sow a row or two occasionally to keep up a supply, and stick when the seedlings are a few inches in height.

Potato.—Plant out a few rows in cool climate districts. Use manure freely, and be careful not to plant unsound or scabby potatoes.

Pumpkin.—Sow extensively seeds, say half a dozen together every 8 feet or so apart, and when the seedlings come up, and have made three or four leaves, thin out all but two, or three at the most.

Radish.—Sow occasionally a little seed to keep up a supply.

Rhubarb.—This is a very good time to sow seed, if any young plants are required.

Tomato.—Plant out from seed bed as extensively as may be required. Advanced plants should be trained as they grow to some kind of support. Watch for signs of disease, and destroy by fire all that show signs of the black spot.

Turnip.—Sow a little seed.

Vegetable Marrow and Squash.—Sow as extensively as may be required. The bush marrow will be found of much value in small gardens, and can be recommended.

Flowers.

It is to be regretted that a good deal more space cannot be provided for the flower garden and shrubbery, as the growing of flowering and ornamental plants is deserving of a good deal of encouragement, for the surroundings of the dwellings of very many of our farmers and settlers are absolutely devoid of any embellishment whatever. Not a plant, not a shrub, not even a single fruit-tree to break the wretched monotony that only too frequently prevails.

Sometimes, on the other hand, most charming little gardens filled with the choicest flowering plants, may be seen, with the latest and most improved annuals and perennials, and the best varieties of roses and other plants that can be obtained. Such gardens provide the owners with incalculable pleasure, and no doubt must tend very much to improve the minds of members of their families.

November, provided the season is good, and rains have been sufficient, should be favourable for a satisfactory show of flowers.

The time for roses continues, and some excellent specimens should still be forthcoming from time to time. As the old flowers wither away, the flower-bearing branches should be cut back slightly, and more roses are likely to appear. If the rose-thrips—the active little insects which may be seen at times spreading all over the flower-buds and flowers—are at all prevalent, it is almost hopeless to expect good roses. The flowers had better be burnt, and thousands of the pests will be destroyed. No other means of destroying them seems to have been discovered.

Annuals of the tender kinds may still be planted if the soil is in suitable condition, but the young plants must be sheltered until they grow sufficiently strong to withstand the heat of the sun. All kinds of the cockscomb or amaranth family may be planted, including the globe amaranths and the brilliantly-coloured leaves varieties. Some of the bulbs such as liliums, hippeastrums, gladioluses and crinums will probably be in flower during the early part of the month.

JAPAN.

IT is anticipated that the Osaka Exhibition, to be held in 1903, will be a great advance on any previous Exhibitions held in Japan. A correspondent of the *Kobe Chronicle* gives the following particulars of previous Exhibitions :—

Tokyo	Exhibition,	1877,	occupied ...	29,800 tsubo.*
,,	,,	1881,	,, ...	43,300 ,,
,,	,,	1890,	,, ...	40,000 ,,
Kyoto	,,	1895,	,, ...	50,000 ,,
Osaka	,,	1903,	will occupy	100,000 ,,

Exhibits will be exempt from Customs duties, provided they are exported within two months after closing the Exhibition. English exhibitors have asked for 1,000 tsubo. The Exhibition will open on March 1st and close on July 31st, 1903.

From official returns it appears that of the total foreign trade of Japan last year 43·4 per cent. was with Asiatic countries, 23·3 per cent. with America, and 30·8 per cent. with other countries.

Japan has already a considerable trade with China in cotton yarn. Silk and tea exports are increasing, and there is a very large trade in the manufacture of matches. In ship-building the Japanese are also making progress, and a Japanese firm have secured an order for five small gunboats—for the United States Government—costing about £5,600 each.

* A tsubo equals 6 feet x 6 feet.

General Notes.

Successful Farming.

THE following letter appeared recently in an exchange, and was signed "Practical Farmer":—"Much is said about the folly of placing men on the land with no previous knowledge of farming, yet one of the very best farmers of his day in Middlesex was the late Alderman Mechi. He was a clerk for eleven years, and during that time he turned the hour allowed for dinner to profitable account by selling razor-strops. In 1840 he purchased a small unproductive farm at Tiptree Heath, heavy, undrained, clayey soil—the barren heath-land of Essex. After a few years he brought the farm into such high productiveness that he realised an average yearly handsome profit. Fields of mangels produced 50 tons to the acre, and farmers visiting Tiptree Heath said they never saw anything to equal Mechi's wheat-fields. The wheat was uniformly good, remarkably regular in height of straw and in size of ear. And this was done on land, none of which would be called good for farming; heavy soil, too strong even for brickmaking, and the light soil, a black dead-looking sand, full of huge lumps of plum-pudding stone. He obtained his results by properly draining the ground, and had great faith in the enriching and ameliorating influence of the sun and the showers upon the land. Whatever surface was not covered with growing crops was broken up deeply. Before his time, poor, half-starved crops were the order of the day on the farms around Tiptree; but on his 170 acres of land, 14 of pasture, and the rest arable, he revolutionised farming. He got 8 quarters of white wheat (64 bushels) to the acre, which was sold for £23, while the straw per acre was worth more than £3, giving a gross produce of £26. He was an advocate of applying manure in a liquid state, and also of thin seeding. He obtained 58 bushels of fine wheat with 2¼ tons of straw from 1 peck of seed per acre two seasons running. He urged that the quantity of oats and wheat produced did not depend so much upon the quantity sown as upon the natural or artificial fertility of the soil, and proved it; and this was a man who, according to the dictum of some, could not possibly be a success on the land." The fact that the late Alderman Mechi turned his dinner respite from clerkly duties to profitable account in the manner described shows that he must have been possessed of a naturally keen commercial instinct. When he took to farming the same commercial instinct dominated his operations. The reason why some people in New South Wales, and other places as well, are unable to make a do of agriculture is that they have not enough commercial instinct to run a penny-in-the-slot machine, and they fail at farming just as inevitably as they would fail at anything else in the wide world. First cousins to these unfortunate people are

those who are able to do most excellent work under strict supervision of a "boss," but cannot act or think upon their own account. Agriculture in all its branches is a business, and it is only those who can regard it in such a light who will be able to make a good livelihood from it.

An Experiment with Saltbush.

Apropos to the article in the last issue of the *Agricultural Gazette* on the saltbush, an experiment tried in the West Leichhardt School garden may prove interesting.

Seeds of the creeping saltbush, and also of the old-man saltbush were planted in the same bed at the same time. The soil was of a clayey nature, and was not enriched by fertilisers. Plants appeared, and at first both species progressed equally satisfactorily. The coming of the drought, however, had disastrous effect on the "Old-man;" the leaves fell off, the extremities of the branches became dry, and the whole plant appeared dead. The recent rains have caused it again to throw out green leaves, so that as far as our experiment is concerned, the Old-man saltbush as a drought-resisting plant was a failure. The very opposite was the case with the creeping saltbush. Throughout all the dry season it has remained beautifully green, its dense crop of leaves has held the moisture and prevented evaporation. On lifting it the ground beneath seems as if it had been recently saturated. Six plants have in twelve months covered an area of 48 square feet, and the mass of foliage is 12 inches in height. In addition to this, dozens of seed have been thrown off, which have produced healthy plants in most unlooked-for spots. The contrast between the two species has been most marked, and seems to point to the conclusion, that, in the drought districts, the creeping saltbush would be a success. It is a very gross feeder, and, I fancy, no other plant would thrive in its vicinity. A portrait of this plant appeared some months back in the *Sydney Mail.*—D. T. Patton.

The Mistletoes of New South Wales.

These parasitic plants are spreading in this State, and have been much in evidence during the drought. I am engaged in thoroughly investigating them, and shall be glad if readers of the *Gazette* all over the State will send me small specimens in flower or seed. The specimens will travel quite well if a little newspaper be wrapped round them, and a label to frank them through the post will be found in each *Gazette*. A twig of the plant on which the mistletoe is growing should also be sent.—J. H. Maiden.

Cool Storage of Eggs.

Regulations.

1. All eggs forwarded for cool storage must be sent, *carriage and cartage prepaid*, to the Government Export Depôt, Darling Harbour, and a letter or postcard advising despatch posted to the Secretary's office at same time.
2. The cases will be received and stored on the owner's account and at his sole risk, and the Government will not be responsible for any loss or damage said to have occurred while the eggs are in store, from whatever cause arising.
3. Store receipts will be issued to the owner, or his agent, when the cases are deposited, and delivery will only be made on production of such store receipts and payments of all charges for handling and storing, as per schedule herein.
4. Cases must be of the kind known as "patent packers," each holding 36 dozen properly packed in cardboard "fillers," as supplied with the cases.

When the eggs have to come long distances, owners would do well to arrange for having them examined before being put into store, and all cracked ones removed, as no responsibility is taken for breakage or damage, and eggs coated with matter from broken ones may suffer injury if not cleaned. Cases must be found by the owner.

Directions.

In order that eggs may be kept fresh and good for from four to six months, it is necessary to see that only *new-laid* ones be selected; where possible, also, it is advisable to have them *infertile*, as when fertile eggs get exposed to a temperature of 98 to 100 degrees, for even a short time, the germ will start into life, and no subsequent treatment will then avail to give them the quality of freshness. Eggs for storage should be gathered *every* morning before the sun has gained strength, and placed at once in the storage boxes in a *cool* place. To attain the highest success, they should be *graded* as to colour and size, the boxes being marked accordingly. Care should also be taken to have them clean and free from unsightly stains. The *boxes* used should be of the usual trade size, holding 36 dozen, and packers should see that they are made of *odourless timber*, as eggs are peculiarly liable to absorb flavours from their surroundings. Another important point is to see that the boxes and fillers are *thoroughly dry* before using, otherwise mustiness is almost sure to ensue. Beyond the fillers of tasteless cardboard, *no packing* of any kind should be used, as the natural moisture exuding from the eggs should be allowed to escape, otherwise a musty flavour is likely to be perceivable when the cases are opened. Eggs for storage should be forwarded, as soon as packed, by quick train or steamer, and handled on the way with the greatest care.

In the interest of the owners it is always advisable to give forty-eight hours notice of the intended withdrawal of cases of eggs; this enables the authorities to place the eggs in a situation where they will be gradually brought back to a normal temperature for market.

During the past season 144,288 dozen of eggs were stored at the Export Depôt on behalf of various owners, with the result that all those conforming to the above conditions were found *perfectly sound* and fresh at from four to nine months from date of storing. *The advantage of storing* is that when eggs are at their lowest they may be put away and kept until markets reach their highest, in April and May, when a profit of from 50 per cent. to 100 per cent. can be realised after paying all expenses.

Those intending to make use of the Export Stores during the current season for storing eggs, are requested to *supply early information* as to their probable quantities, as it is anticipated that the space available will be fully occupied; and notice of early consignments is necessary also on account of the time required to properly regulate the temperature of the chambers.

Eggs should not be forwarded without previously making arrangements for their reception.

Depositors are particularly requested to bear in mind that no delivery can be given without the production of the Store Warrants which must be properly endorsed. The Department is in no way responsible for the contents of the cases when received at or on delivery from the stores either as regards quantity of eggs in the cases or the quality and condition of the eggs.

Eggs are stored under the above conditions, and subject also to the Regulations published in the *Government Gazette* No. 184 of 4th March, 1902, copy of which may be had on application.

Packing cases with fillers, may be purchased in Sydney at a cost of 2s. 6d. each.

Disposal of Products.

The Board for Exports does not undertake to purchase goods with the object of exporting same, or of disposing of products locally, or undertake shipment to any particular salesman or firm, but will furnish any desired information as to probable markets for the sale of New South Wales products.

Pamphlets on poultry raising for export and other agricultural subjects may be procured on application.

Requests have been received from intending depositors for reserved space. This, however, cannot be done. All available storage accommodation will be filled in accordance with priority of receipt of eggs, and due notice will be given by advertisement when the Department is prepared to receive eggs for the season 1902-03.—H. V. JACKSON, Secretary, Board for Exports, Sydney.

AGRICULTURAL SOCIETIES' SHOWS, 1902.

Society.	Secretary.	Date.
Junee P., A., and I. Association	G. W. Scrivener	Sept. 3, 4
Murrumburrah P., A., and I. Association	J. A. Foley	,, 3, 4
Young P. and A. Association	C. H. Ellerman	,, 9, 10
Manildra P. and A. Association (Exhibition and Ploughing Matches)	G. W. Griffith	,, 10
Moama A. and P. Association	C. L. Blair	,, 10
Albury and Border P., A., and H. Association	W. J. Johnson	,, 10, 11
Yass P. and A. Society	W. Thomson	,, 11, 12
Berrigan A. and H. Society	G. Hamilton	,, 17
Germanton P., A., and H. Society	G. T. S. Wilson	,, 17, 18
Burrowa P., A., and H. Association	John N. Clifton	,, 18, 19
Temora A. and P. Society	W. H. Tubman	,, 23, 24
Wentworth P., A., and I. Society	Jas. W. Thorn	Oct. 21

1903.

Lismore Agricultural Society	T. M. Hewitt	Feb. 3, 4, 5
Berry Agricultural Association	A. J. Colley	,, 4, 5, 6, 7
Alstonville Agricultural Society	Frank H. Bartlett	,, 10, 11
Moruya A. and P. Society	John Jeffery	,, 11, 12
Manning River (Taree) A. and H. Association	S. Whitbread	,, 11, 12
Ulladulla A. and H. Association (Milton)	C. A. Cork	,, 18, 19
Candelo Agricultural Association	C. H. Brooks	,, 25, 26
Tumut Agricultural and Pastoral Association	Bland Clayton	,, 25, 26
Robertson Agricultural and Horticultural Society	R. G. Ferguson	,, 26, 27
Bega Agricultural, Pastoral, and Horticultural Society	J. Underhill	Mar. 4, 5
Crookwell A., P., and H. Society	C. T. Clifton	,, 5, 6
Berrima District A., H., and I. Society	J. Yeo	,, 5, 6, 7
Bombala Exhibition Society	R. M. Cook	,, 10, 11
Central New England P. and A. Assoc. (Glen Innes)	Geo. A. Priest	,, 10, 11, 12
Goulburn A., P., and H. Society	J. J. Roberts	,, 12, 13, 14
Gundagai P., A., H., and I. Association	A. Elworthy	,, 18, 19
Inverell P. and A. Society	T. P. Borthwick	,, 18, 19, 20
Armidale and New England P., A., and H. Association (Armidale)	W. H. Allingham	,, 18, 19, 20
Newcastle and District A., H., and I. Association	M. A. Fraser	,, 19, 20, 21
Liverpool Plains (Tamworth) A. and H. Association	J. R. Wood	,, 24, 25
Orange A. and P. Association	W. Tanner	,, 25, 26, 27
Macleay A., H., and I. Association	E. Weeks	,, 25, 26, 27
Cooma Pastoral and Agricultural Association	C. J. Walmsley	April 1, 2
Mudgee Agricultural Society	Joseph M. Cox	,, 1, 2, 3
Royal Agricultural Society of N.S.W. (Sydney)	F. Webster	,, –16
Dungog A. and H. Association	Chas. E. Grant	,, 29, 30
Upper Manning (Wingham) A. and H. Association	W. Dimond	May 6, 7

[5 plates.]

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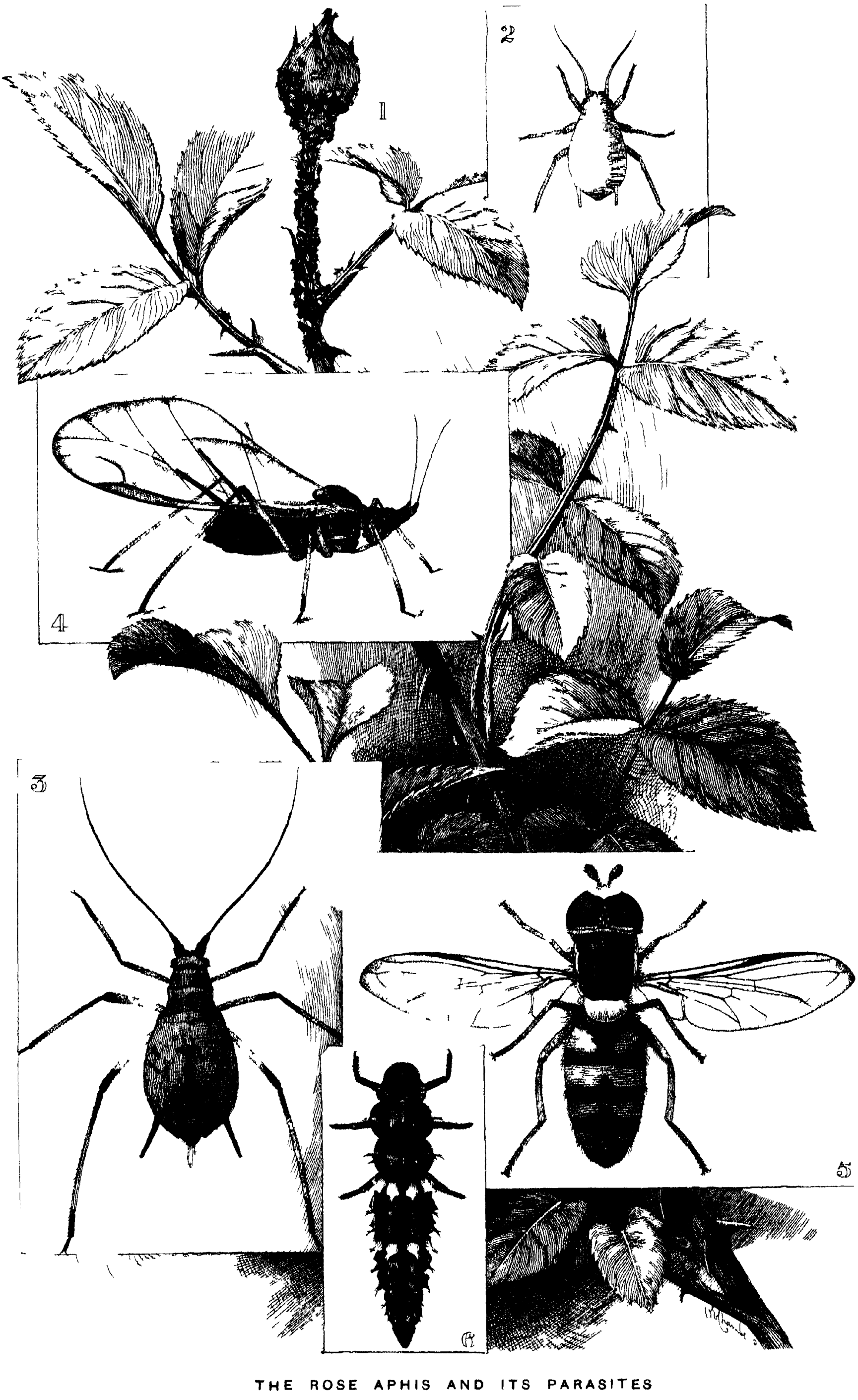


THE ROSE APHIS AND ITS PARASITES

1 *Spray of Rose-bush attacked by Aphis*
2 *Larva of Rose Aphis*
3 *Wingless Female Rose Aphis*
4 *Winged Female Rose Aphis*
5 *Hover Fly (Psilopus Sydneyensis)*
6 *Larva of Lady bird Beetle (Leis conformis)*

Vol. XIII. Part 12. DECEMBER, 1902.

Agricultural Gazette of New South Wales.

Some Garden Pests.

WALTER W. FROGGATT, F.L.S.,
Government Entomologist.

THERE is no more entrancing work in the world than that connected with a flower garden, whether carried out by our little tot, who plants her few sweet peas in her own small plot of ground and religiously digs them up every morning to see if they are growing, or by the hard-headed old Scotch gardener, learned in all the arts of potting, budding, layering, and the hundred other secrets gained from close observation for years of his dainty, beautiful charges. Ever since the time that "Adam delved and Eve span," every householder, at some season of his life, has pottered about his garden, and even in the terraced houses of our big cities we see the instinctive love of plant-life cropping out in the two or three shrubs and grass plot in front, or the forlorn-looking staghorn ferns slowly burning to death on the ironwork of the verandah.

Fortunate is the man who, in the midsummer of his life, is able to settle down to the cares and contentment of a home garden, and is happy in doing so. For a garden is a world in itself, where thousands of strange little creatures live and enjoy the bright sunshine and summer showers, where some birds take up their home, and others stop as a resting-place on a longer journey; and it is of the life-history of the denizens of this busy little world that I propose to furnish a few notes. Charming old Oliver Wendell Holmes, in one of his stories, describes the life found under an overturned stone in rather unflattering terms, to point a moral; but if he had been more of a naturalist, he would have found more than one sermon under that stone, for a garden seat or stone shelters many curious little creatures worth more than a passing glance. Darwin has shown, in his "Formation of Vegetable Mould through the action of Worms," what a wonderfully interesting fellow our common earthworm is, and what an amount of information can be obtained by a study of its habits. Earthworms are plentiful in the morning after a heavy rain all over the asphalt paths, driven out of the sodden ground, and squirming along as they make for the drier lawn. "They are not nice things to nurse," as my little girl observed, after holding one up by the tail, "they are too dirty," and I must confess that my first acquaintance with them was in digging them out of the stable heap as bait for blackfish; but they play an important part in the economy of nature, devouring leaf-mould, and returning it to the pasturage in the shape of castings, so that the soil is being continually cultivated, turned over, and enriched by their presence. Darwin has shown by actual experiment, that in some of the rich grass lands of England as much as 10 tons of earth per acre

is annually passed through their bodies, and thus brought to the surface. Though without ears or eyes, the earthworm is very sensitive to the influence of light. Its body is composed of from 130 to 150 cylindrical segments, with a blunt head and pointed tail; and though soft enough when crawling on the path, soon shows the power of its muscles when one tries to drag it out of its burrow. At least three species are common in our gardens, one of which has been introduced from Europe. Though *Lumbricus* is such a friend in grass lands, he is somewhat out of place in a bed of young seedlings, where he gnaws their roots off; but, taken all round, his usefulness outbalances the mischief.

Another and much more obnoxious dweller in the garden is the common snail *(Helix aspersa)*, introduced from Europe, where, in Southern Italy and Sicily, it is one of the molluscs eaten by the natives. This snail has wandered all over the world. It is an enemy that all Sydney gardeners have to wage war upon, for, given a comfortable home, undisturbed by seagulls or the native black rat, they soon multiply, and bunches of their round transparent eggs can be found under every board or stone. Lime, salt, tobacco, and other materials are all a check; but their value is discounted by every shower, and they have to be constantly renewed. Snails are most easily captured on showery evenings, and hunting round at about 9 o'clock, with an old paint tin half full of salt and water, into which every one is dropped as soon as he comes under the light of the lantern, I find that with a little persistence the plants can soon be cleared of these pests; and their cousins, the soft slugs, can be effectually treated in the same manner.

Yet there are lessons to be learnt from the despised snail, who has spread all over the world; he is a wonderful fellow for adapting himself to his surroundings, for when dry weather sets in he retreats into a secure corner, withdraws into his shell, and hermetically seals up the opening with a diaphragm or false operculum composed of slime and calcareous matter, so that he can remain for an indefinite period secure from harm. There is, I believe, a record of a foreign snail shell that was received from abroad by the British Museum authorities gummed to a card. It remained in the collections for a number of years, until, in remodelling the contents, this shell was soaked off the card, when the imprisoned snail calmly put out its horns and crawled across the table.

Among the long grass of the lawn we find the open vertical circular shaft of the trap-door spider (*Idiommata reticulata*) upholstered with a lining of soft white silk, to the edge of which is securely attached the wad of silk and earth that forms a close-fitting lid when turned over. Take a grass stalk and poke it down the hole, and you will find her seize and shake it, but she is too wary to let you pull her out; look down and you will see her bright eyes glaring up. One would think that with such a secure retreat, where the hook of her long leg can pull the lid down, that nothing could injure a trap-door spider, but this is not the case, for there is a large black, sand-digging wasp (*Priocnemis sp.?*), which boldly descends the shaft and drags the

spider out, flying off with the limp body to store in her underground nest as food for her unborn children. There are plenty of the little jumping spiders (*Attidæ*) skirmishing along on the paling fence in the bright sunshine; active little fellows that stalk their prey until they get within jumping distance, and they seldom miss their quarry. Many of them adapt their clothes to the colour of their hunting grounds; pale yellow and green when living among foliage, brown or grey when on walls and fences; some are regular mimics, and the males are ornamented with bright-coloured appendages on the fore legs to charm the fair sex. Many a pleasant half-hour can be passed watching their antics.

We can generally find, with a little careful watching, one or two of the small green Mantis (*Orthodera prasina*) lurking among the foliage of the evergreen shrubs, her coat of green as bright as the surrounding leaves, her dangerous spined fore legs raised above the head, and beautiful large bright eyes watching every movement of the insects flying around. Most innocent and delicate in form, she reminds one of a graceful girl; but look at that white butterfly as it flits along and incautiously rests but a moment on the leaf; like a bolt from a gun Miss Mantis strikes with her raised fore legs, and the fluttering butterfly is impaled on the cruel spines, and crushed to death. Rapidly the body is brought beneath her head, when the sharp-pointed mouth pierces its chest, and she is soon sucking up its life blood. Like many others, Miss Mantis is not half as innocent as she looks, but a bloodthirsty little savage, killing and devouring creatures as large as herself.

You will often notice the foliage of the rose-bushes becoming much aborted or wrinkled, particularly if they are growing in a sheltered corner of the garden, or after a spell of damp weather, for both these conditions are suitable for the growth and dispersal of the tiny little organisms that produce the disease known as "powdery mildew." As the season advances, most of the bushes throw off all signs of this pest, but Bordeaux mixture or sulphur will generally check it if taken in time.

Wherever do these swarms of rose aphis come from? Covering every young shoot and bud with their countless multitudes where a few days ago we did not notice any. The growth and multiplication of these aphides is like compound interest on a moneylender's bill. The first generation, or queen mother aphides, are born from eggs laid at the end of summer in the crevices of the bark, and as each of these can produce almost immediately up to 100 living young females, which in turn commence reproducing their kind, and as this goes on for nine to sixteen generations in the course of a season, it is no wonder that they appear as if by magic, and so lead people to imagine that they grow by spontaneous generation out of the ground, just as an Australian newspaper report gravely stated only a few years ago that "scale insects were produced from crystalline dew."

The rose aphis has a scientific name, *Siphonophora rosæ*, which is compounded from two Greek words meaning "tube bearing," in allusion to the two long tubes on the hind part of the body. Under a

lens they are dainty-looking little creatures, varying from delicate green to pink in colour, with long slender antennæ and legs, and the two stout tubes or nectaries (mentioned before) standing out on either side. The ants know all about these tubes, and come round them to drink the sweet sap or "honey dew" that the aphis discharges through these organs. They are armed with a very long slender-pointed tubular mouth, which is pricked into the bark, and the sap is pumped up, the flower-buds being affected in consequence.

So soft and delicate that the least pressure will crush them, the aphides have many enemies that look upon them as dainty morsels. You can often see the pretty little blue-capped wrens and robins making a meal of aphides, but their most relentless enemies are other insects, chief of which is the larvæ of the banded hover fly (*Psilopus Sydneyensis*). Watch the crowd of long-legged aphides on the branch, and you will see crawling among them a semi-transparent green-tinted slug-like maggot, which works along like a concertina, now extended long and slender, and then humped up in a rounded mass. It does not seem to have much head, but if you observe it closely as it shoulders its way through the clustering aphides you will find that it has a considerable mouth, and its chief object in view is to stuff itself with fat juicy aphides. When full-grown it will drop to the ground, and seal itself up in a pupa-case, from which the adult fly will emerge about a week later. See the number of brightly-banded black and yellow flies hovering round the rose-bush, their wings moving so rapidly that the body remains almost stationary. These are the adult insects, and every now and then they alight upon the foliage to deposit their eggs among the doomed aphides, or drink up the honey-dew discharged from their nectaries. Besides these flies, there are many kinds of little four-winged wasps, that, armed with a needle-like ovipositor, prick the skin of the full-grown wingless aphides, at the same time depositing an egg, from which soon after a tiny maggot emerges, eating up the internal portions of the host, and pupating inside its brown skin, which remains attached to the twig until the little parasite gnaws its way out through a circular hole in the side of the body.

Soon afterwards the rich coloured red-and-black-spotted ladybird (*Leis conformis*) will be found eating the rose aphis, and very soon after her arrival her curious smoky-brown coloured larvæ, with two bands of reddish spots across the back, will be noticed busily engaged crawling about on the infested foliage, and making further gaps in the ranks of the hapless aphides.

The commonest scale-insect upon the rose-bushes is *Diaspis rosæ*, a delicate snow-white scale, about one-tenth of an inch in diameter, but sometimes so plentiful on bushes growing in sheltered corners that the branches become quite encrusted. It is common all over the world, and is reported to have killed out the blackberry-bushes in New Zealand; but here, on account of its delicate structure, it is easily removed. We frequently find odd specimens of the Cottony Cushion or Fluted Scale (*Icerya Purchasi*) upon our bushes. The scale, covering a multitude of eggs, looks like a dab of rounded cotton

wool on the branch, but its many enemies never let it increase in sufficient numbers to do the bushes any damage. It is quite a different thing when the Red Orange Scale (*Aspidiotus aurantii*) finds its way on to these bushes, for it discolours the bark, covering it with rusty red blotches, and, if neglected, will soon kill them. It is generally communicated to the roses from some adjacent lemon or orange tree. Painting or spraying with pure kerosene is the most effective way of killing it out, at the same time cutting out the diseased wood.

Another, and sometimes very serious, pest to the best blooms on our rose-bushes is a tiny little reddish-brown insect, the Rose Thrip, which frequents many different flowers to feed upon the pollen. Thrips sometimes come in such swarms that the roses fall to pieces before they are full-blown. As these tiny little creatures do not like water or open air, the best manner to get them out is to drench the rose-bushes with water, and grow them on well-ventilated spots. Walking down the path, you can see several little shining black beetles running over the asphalt, darting along from the cover of one stone to shelter beneath a bit of stick; they slip round and rush off again till they gain the shelter of the grass-covered lawn, like soldiers advancing under fire in the open, for they are little carab beetles, nocturnal in their habits and feeding upon smaller helpless creatures; so, in the daytime, their home is under a clod of earth, and they know quite well it is dangerous to be out in the open in the bright sunshine when hungry birds are about. Turning over a board near the drain-pipe, we disturb several others, and a much larger dark-brown fellow, of similar habits, but ornamented with two large yellow blotches on his wing-covers. This is our common Bombardier Beetle (*Pheropsophus verticalis*), which is armed with a most remarkable magazine rifle in the tip of his body, from which, at the least alarm, he discharges a little cloud of acrid vapour with a distinct report, that is quite sufficient to cause any inexperienced little bird who is foolish enough to make a snap at him to drop him like a hot potato. This discharge can be repeated several times until the supply is exhausted, and the acid gas is strong enough to stain one's nails a dull purple.

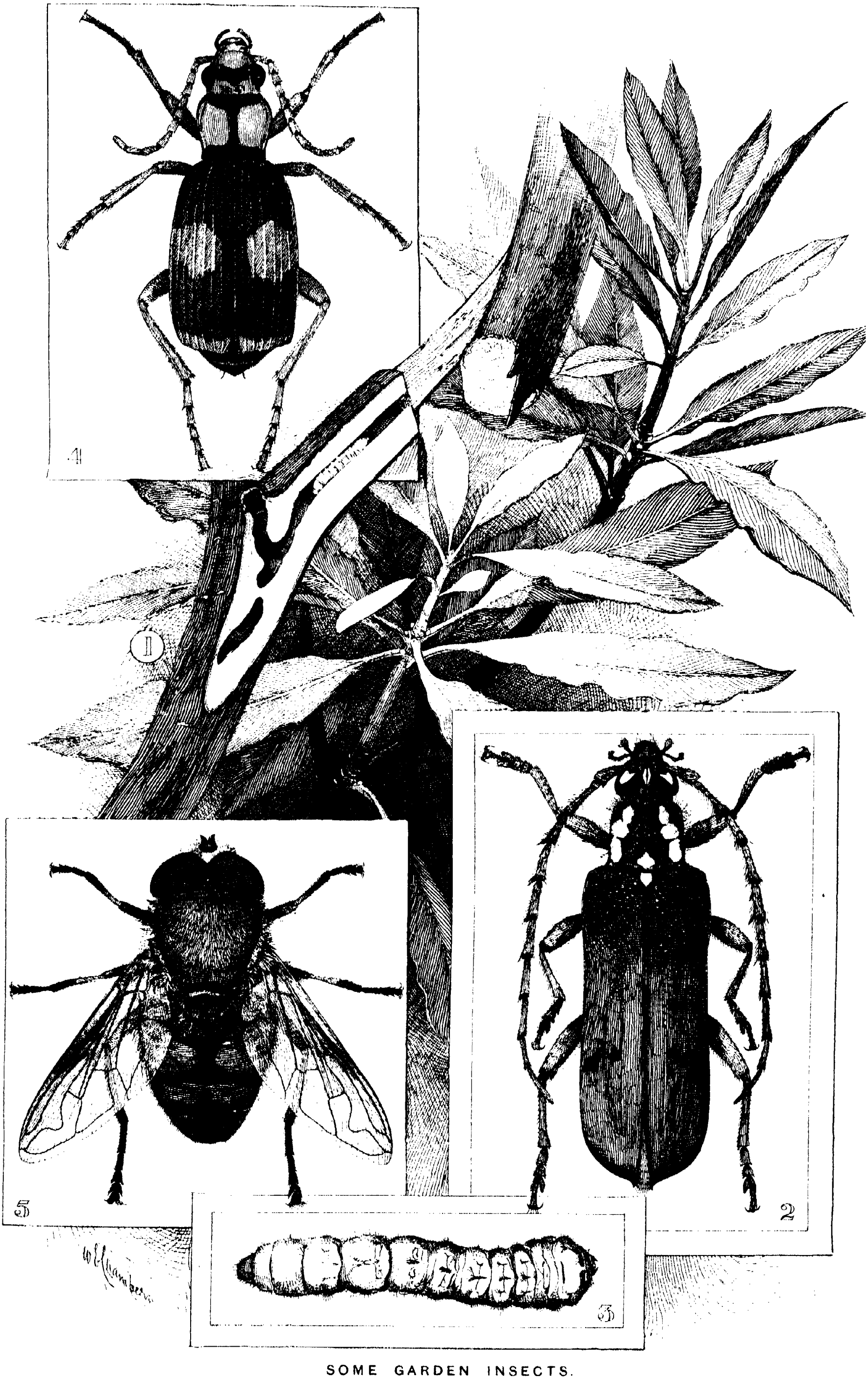
When digging in the garden in the winter, we often turn up quite a number of large, fat, white grubs, for which the chickens always return thanks, if they are collected and thrown into the yard. Later on in the season, we find these grubs, changed in dull yellow pupæ, enclosed in a regular chamber in the clay, from which still later on in the season come the cockchafer beetles (*Anoplognathus analis* and *A. porosus*), large light-brown fellows, with stout legs and large claws, well adapted for clinging to the foliage while they are eating their breakfast. In their native state they swarm over the tops of the young gum-trees, which they frequently strip of all their young foliage; but in the garden they chiefly confine their attention to the pepper trees, and it is rather curious that the beautiful large green caterpillar of the Australian Silkworm Moth has also taken to this introduced tree as a food plant. Wherever we have the English privet growing, we are sure to find in due season the beautiful green-painted caterpillar of the Privet Hawk-moth (*Chaerocampa ligustri*) feeding upon the

foliage, and so beautifully do its colours blend with the surrounding leaves that one seldom notices it, in spite of its large size, until the twigs are stripped or its droppings on the path catch one's eye. The hawk-moths are seldom noticed by the ordinary person, as they only appear just at twilight, "'twixt the gloaming and the mirk," hovering over the flowers and sucking up the nectar, which many of the larger tubular flowers secrete, by means of a beautifully adapted spiral tubular mouth, several inches in length, which, when at rest, is curled up under the head like a watch-spring. Their bodies are very stout and thick in proportion to their somewhat small wings, but, nevertheless, they are very powerful flyers, and can remain stationary for quite a long time over a bloom, their wings making a humming sound from the rapidity with which they reverberate. Half a dozen different species of hawk-moths are visitors to our garden, but, unless you breed them from the caterpillars, one seldom observes them on the wing.

A number of butterflies visit us during the season, and a few breed in the garden, The curious short, rounded, green, slug-like larva of the Green Wanderer (*Papilio sarpedon*) feeds upon the camphor laurel, and the beautiful angular-winged butterfly, with the rich elongate green blotch in the centre of the wings, which contrasts well with the surrounding spotted velvety black, comes dashing about the shrubs as if he had not a moment to spare. A restless sprite is he in his brilliant green and black livery.

The "Brown Gipsy," as the American children call the large mottled black and bright orange-red butterfly (*Danais plexippus*), is much more leisurely in his movements. Originally a citizen of the United States, he has spread all over the world, and is found in this country wherever the introduced cotton or bladder-weed grows. The caterpillars are pretty white and black banded creatures, and the pupa, hung up by the tail on the stems of the food plant, a beautiful pale green colour. He seldom stops long in the garden, fluttering out as steadily as he entered. The common white butterfly (*Pieris teutonia*), which lays its eggs upon the different species of caper-bushes, is only a stray visitor with us, for we have nothing like her food plant growing here, but the large black Papilio (*P. erectheus*), whose caterpillars devour the foliage of the orange-trees, stops long enough to lay her eggs upon the tree, because, shortly after her appearance, we find the curious black-mottled grubs, which, when full-grown, project two curious fleshy horns in the front of the head when handled, at the same time giving forth a peculiar smell. There are a few other butterflies which find out the sweets of the garden, but those mentioned are the most common and typical.

Passing along the pittosporum hedge, one notices a large dead branch, the brown leaves showing up among the surrounding green foliage, and on examination into the cause, finds that it has been neatly cut off by a borer, which has eaten right round just beneath the bark. This is the work of the caterpillar of a handsome brown longicorn, richly marked with white on the thorax (*Strongylurus thoracicus*), which is very destructive to this particular pittosporum (*P. eugenoides*) and



SOME GARDEN INSECTS.

1. *Stem of Pittosporum eugeniodes attacked by Larva of Beetle (Strongylurus thoracicus).*
2. *Strongylurus thoracicus.*
3. *Larva of No. 2 removed from branch.*
4. *Pheropsophus verticalis.*
5. *Eristalis tenax (the Bee-fly).*

also the white cedar. When the grub has girdled the branch, it generally burrows down the centre, sometimes several feet, before it pupates; and in an infested tree, where these grubs are at work, you can see fine streams of sawdust falling from the holes in the branches. Such branches should be cut out in time and burnt before the beetles can emerge.

Where any sweet-scented flower is blooming, the Bee-flies (*Eristalis tenax*) come for the honey, and with their hairy head and thorax and smooth shining bodies are very like honey bees at first sight, till one finds they only have one pair of wings, and all the bees have two. Though this fly comes round the flower, its curious white rat-tailed larvæ are found in stagnant water or decaying putrid vegetable matter.

Wherever we walk we find the air teeming with life; clouds of little gnats float and dance in the air, while countless numbers of tiny creatures, hardly visible to the naked eye, yet as perfect in every detail as the larger creatures, either find their living upon the plants or devour some tiny thing more puny than themselves.

The Peanut for Poultry.

The peanut is one of the best foods that I have ever fed to poultry (says a writer in the *Texas Stockman*). It far excels maize, wheat, or oats for laying hens as well as for growing chicks.

1. Hens or chicks will not get fat on peanuts as they will on maize or wheat.

2. Hens will lay more eggs and chicks will grow faster than if fed on maize or wheat.

3. They are a health-giving food to all kinds of poultry.

4. They will grow on almost any kind of soil from the poorest white sand to a sandy clay.

5. They will get ripe farther north than the earliest maize.

6. You can raise more peanuts to a given piece of ground than you can of maize or wheat, and it is not so much work to raise them as it is to raise corn.

7. They are the best feed to throw in scratching shed with tops and all, and hens can be kept busy all day. They will work for them and lay too.

Wherever peanuts (or earthnuts, as they are sometimes called) have been tried in New South Wales successful results have been reported. They are easily cultivated, and the "nuts," which grow in a cluster underground, can be dug up and stored for a long time without much care, or fowls or pigs can be turned in to root out the crop for themselves. In a season like this it is not too late yet for moderate sowings in friable soil.

Suggestions offered by the Indian Horse and Mule Breeding Commission to Australian Breeders.

ALEX. BRUCE.

THIS Commission was appointed by the Government of India in 1900 to ascertain the cause of the comparative failure of the system under which the assistance was then given to the native breeders, and to offer suggestions for its improvement, "the aim of the Government being to make India, if possible, independent of Australia in the matter of remounts, and to horse all regiments of cavalry, and, if possible, eventually artillery also with country breds and Arabs only."

The Commission submitted their report on the 31st July, 1901, and as a considerable portion of the horses belonging to the Indian Army are Australian bred, they could not carry out the object for which they were appointed without inspecting and reporting on them as well as on the Indian bred, and as their remarks contain information which will prove both interesting and valuable to our breeders, they are here given in a condensed form, together with some special suggestions as to the description, size, breeding, shape, and action, at which Australian breeders should aim. These the Commission have kindly offered for their benefit, besides going to the trouble of sending the appended photographs of the several stamps of horses to which they refer.

Those who have read the review of the portion of Sir Walter Gilbey's booklet on horse breeding in England and India, which appeared in the October *Gazette*, will understand how the Indian Government have endeavoured to carry their resolution into effect and make India in the matter of remounts independent of Australia, but as many of our breeders may not have seen the October number of the *Gazette*, it seems necessary to state, very briefly, what steps they took to secure the end they had in view. They were :—

(1.) In 1794 the Government created a Stud Department which purchased mares and imported entires, and for many years bred a great number of the horses required for the Army. A certain measure of success was accomplished. Some excellent horses were bred, but experience showed that the results were not commensurate with the cost of maintaining the studs, and in 1876 the Department was abolished, and the Army Remounts and Horse Breeding Departments were created.

(2.) From the time that the Army Remounts and Horse Breeding Departments were created in 1876 till at least this Commission was appointed (it is not known here yet whether their recommendations were adopted), the Indian Government have been endeavouring to

attain the object at which they have been aiming by the establishment of covering stations throughout the country where required, and giving the native breeders the use free of charge, for their selected and branded mares, of suitable stallions provided by the Government, with the understanding that the progeny, where they are suitable for military purposes, would be purchased by the Department.

The Commission say, at paragraph 7: For the assimilation of war and peace conditions as far as practicable the Commission suggest that Australian breeders should be encouraged in future to breed the majority of the horses for the Indian market as far as possible of one type, the weight-carrying hunter of sufficient blood and undeniable substance of height from 14·2 to 15·1.

It is not intended to lay it down that suitable horses of 15·2 should be refused, but as a general standard a height of 14·2 to 15·1 should be accepted for all horses. The universal system of pole-draught, at present obtaining in the Horse and Field Artillery, renders this apparently not only feasible but desirable. It may be assumed that if it is eventually possible to mount the cavalry, and horse the artillery with this type of horse, the general mounting will be as efficient as possible. This type of horse should be defined as being specially strong in the following points:—

Sufficient quality.

Balance; which can only result from a sufficiently true general conformation.

Depth of girth and roundness and depth of back ribs.

Shortness of back.

Absolute straightness in forelegs as observed from the front, including the column of leg and its extremities to the foot itself.

Action decided and true all round.

The Commission are aware that such a type can only be attained after the lapse of a considerable period of years, but they are convinced that a class possessing these characteristics should be fixed on as a guide to breeders and purchasers of service horses. The modification of the allotment lists has been proposed with a view to simplifying the operations of both breeding and buying. The photographs Nos. 1 to 3 and 7 represent the class of horse.

At Saharunpur, No. 3,810, a bay Australian, 6 years old (see photograph No. 2), was selected as a typical field artillery horse; he weighed 1,066 lb. At the same time, No. 1,257, bay country-bred filly (by "Studley Royal," a thoroughbred English horse), 3½ years old, 15·1¼ in height was weighed; she scaled 1,082 lb. Also, No. 1,306, bay country-bred gelding (by "Ville Juste," a thoroughbred English horse), 3 years old, 15·0½ in height, he scaled 1,004 lb. These instances go to show that country-bred horses, fit for both cavalry and artillery, can be bred in India.

10.—*Weighing.*

The Commission here remark: "While on the subject of weight, it would be well to point out that weighing machines should be supplied at all depôts. In many cases the scales are a truer guide to the power of the horse than either the eye or the tape, especially with a growing animal. In the United States, as a rule, the weight as well as the height is quoted in describing the horse.

11.—*Opinion offered by the Australian shippers with respect to our horses, and the remedies they suggest.*

While at Calcutta, the Commission met the Australian shippers and heard their views on the horse supply, and subsequently the following letter, signed by all the principal shippers, was received:—"We have the honor to place before you our views regarding the horse-breeding in Australia. In our opinion, it is deteriorating, due to the cause of inferior stallions and exporting most of the best mares, breeders being tempted to sell, on account of the high prices given for Indian remounts. We think it would be beneficial to the industry if you were to advise the Australian Governments to put a heavy tax on stallions, and limit the exportation of mares suitable for breeding. Also, the Governments should supply a number of stallions for the use of breeders at a nominal fee for service."

The following extract of a letter, similarly signed, written on another subject, is worthy of attention:—"That, owing to the increased demand in South Africa, China, and elsewhere, and the extra freight paid by us to the shipowners, we have to pay much higher prices in order to fill our orders satisfactorily. The supply is decreasing and deteriorating by the lavish export of the best mares, the inferior ones only being left for breeding; by the increased demands of other countries, demands that are likely to increase rather than diminish, and because inferior stallions are used. Thus, if the present standard of remounts is to be maintained, it is certain the price must be raised. And, in the opinion of those members of the Commission who have watched the horse supply for some years, not only has deterioration set in, but it is bound to increase rapidly. The shippers assert that India has many of the best mares now, and the number of mares purchased does not decrease."

The foregoing statements, contained in paragraph 11 of the report with respect to the deterioration of Australian horses, its cause and remedy, call for the following remarks:—

Deterioration of Australian horses, and likely to increase rapidly.

It will be seen by this paragraph that the Commission concur with the Australian shippers in the opinion that Australian horses are deteriorating, and that they are doing so principally at least from the two following causes:—

From the use of inferior stallions.—This is perhaps the case to some extent as regards the ordinary stamp of entire used by some breeders who make no pretension to breed specially for the Indian market. but not as regards the principal breeders who breed specially for that

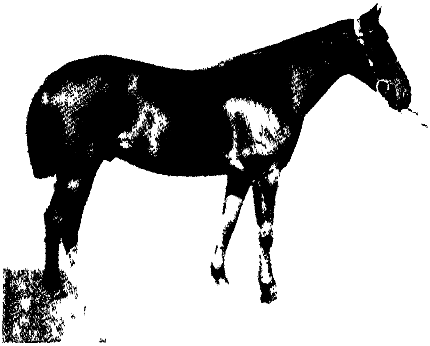


Fig. 1. Type for Horse Artillery. Bay Australian gelding. Age 6 yrs.; height 15.2; weight 1,196 lb.

Fig. 2. Type for Field Artillery. Bay Australian gelding. Age 6 yrs.; height, 15.1; girth, 70 in.; shank 7 in.; weight 1,066 lb.

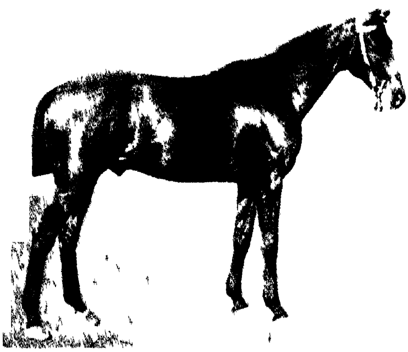


Fig. 3. Type for Cavalry. Brown Australian gelding. Age 8 yrs.; height 15.2.

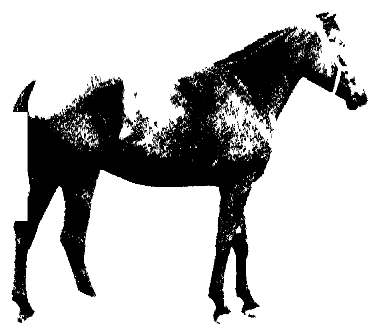


Fig. 7. Type of country-bred horse, by an Arab out of an Australian mare, fit for Horse Artillery. Black gelding. Age 4 yrs. 7 mos.; height, 15.2½; girth 73½ in.; shank 8½ in.; weight 1,114 lb.

Fig. 14. Type of thoroughbred English stallion required. "Wicklow Spar." Age, 10 yrs.; height, 15.2½ in.; girth, 72 in.; shank, 8½ in. Has got excellent stock.

Fig. 16. Type of thoroughbred Australian stallion "Pickwick," by "Swiveller," dam, "The Gem." Brown Australian horse. Age 9 yrs.; height, 15.2¾; girth, 69 in.; shank, 8 in. Has got excellent stock.

TYPES OF HORSES REFERRED TO IN REPORT OF THE HORSE AND MULE BREEDING COMMISSION, INDIA.

market; and it was also quite as much to the buyers in Australia declining to give the increased prices which the breeders were then asking for first-class horses through the increased demand there was for horses for South Africa. The principal breeders for India have now as good entires as they ever had, and if the buyers were prepared to pay the increased prices, the breeders would sell them as good horses as ever.

The export of most of the best mares.—This statement is too sweeping. There is no doubt that considerable numbers of mares, in every way adapted for the stud, from which first-class remounts could be bred, are exported, but to say that the supply is decreasing and deteriorating by the lavish export of the best mares, the inferior ones only being bred from, is exaggeration. The more extensive breeders—and it is from them that by far the principal portion of the supply goes to India—do not sell mares that would make good brood mares, unless they are actually obliged, which they very seldom are.

Remedies suggested by Shippers for deterioration in Australian Horses.

They are the following:—

1. *To impose a heavy tax on stallions.*—Any tax on stallions which is proposed would need to be a light and not a heavy one, for there exists considerable objection to any tax at all, and those who are opposed to legislation say that the only reason which could be adduced for such a measure would be to obtain power to make the necessary professional examination of the stallions for disease and hereditary defects, the cost of which would be comparatively little and entail the imposition of only a light tax; whereas a Bill, proposing a tax heavy enough to lead the owners of inferior and unsuitable stallions to withdraw them from service, would have to be drastic, and would, on that account, have little chance of passing.

2. *To limit the exportation of mares suitable for breeding.*—The sale and export of good brood mares is an evil with which the Imperial Government have also had for many years to contend at Home, and failed as yet at least to find a remedy. Large numbers of first-class mares are annually taken from the United Kingdom to the Continent, as they are from Australia to India, without any prospect, either there or here, of the trade being stopped. Something might perhaps be done by legislation, under which the owner of the mare would suffer no loss, but it would have to be left with him whether he would sell to the shipper or not. Neither a prohibition nor limit could be issued.

3. *The Government to supply approved stallions at a nominal fee for service.*—This would be following the example of the leading Continental nations and India (see pages 999 and 1000 of the October *Gazette*), and would entail very considerable outlay; for, if stallions are provided for one district, they would have to be so also for another, and as that is the case, it is a question whether the proposal could be entertained. If it is, an annual vote would have to be obtained from Parliament, and proper arrangements made for the accommodation and care of the horses.

The shippers further stated that they believed breeders would introduce changes for the benefit of the Indian market if they knew what was wanted, but that purchasers had different ideas, and there were no principles on which to take action. The kind of horse required, which has been described on page 1175, under paragraph 7, may be judged from photographs 1, 2, 3, and 7, and the type of stallion which should be used in their production may be seen in photographs 14 and 16.

Establishment of Agencies by the Indian Government in Australia for the Purchase of Horses for Military Purposes.*

During the year nearly 9,000 horses were exported from this State, principally to South Africa for war purposes. Owing to the large numbers exported, and the demand for a good class of horse for military purposes, breeders have been able to obtain fair prices, with a result that horse-breeding is now receiving considerable attention.

This being the case, there has been a great deal of discussion among breeders, and in the Press, on matters connected with horse-breeding, and, among others, on the question how the purchasers for the Imperial and Indian Governments and our breeders can be brought into more direct and closer contact. A largely-attended conference of breeders, at which this and other matters in which they are interested were fully discussed and a number of resolutions passed, which were submitted to the Honorable the Premier. One of the resolutions was to the effect, "That it is desirable that the Indian and Imperial Governments should establish official agencies in New South Wales with a view to purchasing direct from the horse-breeders." No communication has been received from either the Imperial or Indian Government, but a Commission appointed by the latter Government in October, 1900, in their report, which they submitted in July last, reported strongly against the establishment of depôts in Australia for buying remounts, and offer the following objections (upon which I make some remarks), which Commission consider sufficient to deter the Government of India from adopting this proposal.

(*a*) "That the experiment has been tried and proved a failure."

The experiment here referred to was made some fifty or sixty years ago, and it is understood was brought to a conclusion through the officer in charge of the depôt failing to act up to his instructions—not that the depôt system was an inefficient one. Besides, though under the terms of this resolution of the Conference depôts might, perhaps, be established, they need not necessarily be so, for the resolution says

* From the Report, 1902, of Mr. Alex. Bruce, Chief Inspector of Stock.

"agencies" not "depôts"; and, supposing the horses were for the Indian Government, two of the remount staff of the Indian Army and a veterinary surgeon could visit the different Australian States twice a year, and, by announcing when they were to be at the different centres at which they would inspect the horses which were for sale, be able to do so in all the States in the course of, say, three months. This is the course followed by the officers who purchased the horses sent to South Africa for the Imperial Government, except that it is here, for greater security, proposed that, instead of one officer and a veterinary surgeon, there should be two to select and pass each horse after he has been found by the veterinary surgeon to be sound and free from blemish.

Such an arrangement would be both a safe and inexpensive one, while the purchasing officers would have an opportunity of seeing all the horses in the States likely to suit them. In no other way could such a number of horses be brought together for inspection.

(*b*) "That an exceptionally skilful and experienced staff of buyers must always be maintained, and any want of tact or judgment on their part might result in the formation of an adverse ring among the breeders."

If a single officer and veterinary surgeon could inspect, pass, purchase, and ship, as they did, the horses for South Africa, which, although the officers purchasing were confined to very low limit as to price, met with the approval of the Military authorities on their arrival there, surely the proposal to have two officers, instead of one, and the veterinary surgeon would render the transaction a perfectly safe one, so far as the Indian Government is concerned; and, if it were thought necessary to take any further precautions in that direction, the Government might fix a price they would give for a certain class of cavalry, artillery, and transport horse, and the only question for the purchasing officers to decide would then be whether the horse offered was suitable for the class for which he was offered. There would be no dealing or bargaining.

In this objection, allusion is made to the staff which would have to be maintained, as if it would be an expensive one; but the staff for the system here proposed, consisting as it would of only three officers, could not possibly be an expensive one.

As to the breeders forming adverse rings, that would be practically impossible. The number attending at a centre would be too few, and the centres at which they met the purchasing officers too scattered and far apart to allow the breeders to combine.

(*c*) "That a heavy outlay in purchase of a depôt would be necessary. It is understood that good land, conveniently placed, could not be acquired for less than £10 an acre, and the risk of disease breaking out would be considerable unless there was a large range of paddocks."

If the course adopted by the officers who purchased for the Imperial Government, here recommended, was followed, there would be no need to purchase any land nor to erect any depôt. All that would be necessary in that direction would be, here again, to follow the example

of officers purchasing for South Africa, and rent for two or three months good, securely fenced paddocks near the port at which the horses are to be shipped, to which they would be sent as purchased, and put in the charge of a trustworthy man till they are about to leave.

The Commission are labouring under a mistake when they think there would be considerable risk of disease breaking out amongst the horses which are purchased, while they are waiting for shipment. There is no part of the world in which horses are freer from infectious or contagious disease than Australia, which, with the short time they have to be kept till shipped, renders the risk from disease deserving of very little, if any, consideration.

(*d*) "That it is very difficult to select 'eye-sound' horses of suitable type from a mob of unhandled animals, and a number of misfits would be the inevitable consequence. These a dealer could get rid of, perhaps, without much loss, but a Government buyer in a similar position would be certain to lose heavily."

This objection could be got over by the Indian Government making it a condition that all horses offered to them should be broken to lead. Such a condition would be to the advantage of the Indian Government, as they would have a better opportunity of examining the horses broken to lead than they now have, offered, as they are, unbroken; and there is no doubt it would also be to the advantage of the breeder, in a good many ways, if he were to break to lead his young stock intended to be offered for sale for military purposes. There would, therefore, be fewer misfits, and, as a result, better prices to the breeder.

(*e*) "That there would be complaints about interfering with a trade."

If there was any weight in this objection, there would certainly be very much greater objection on the same ground to the Commission proposing, as they do, to revert to the system of Government horse-breeding carried on by the Stud Department from 1794 to 1876, when it was abolished, as much better horses could be imported at less money. This was a greater interference with trade than the establishment of depôts in Australia would be. It is, to say the least of it, therefore, somewhat inconsistent in the Commission to raise the objection which they here do. There is, however, no weight in the objection, as the question is not whether the proposal would interfere with trade, but whether it would be for the benefit of the breeders and the Indian Government, which it is believed it would be, if carried out as explained, in the same manner as by the purchasers for the Imperial Government.

(*f*) "That the establishment of such a concern would absorb money, energy, and attention, which would be better employed in fostering horse-breeding in India."

Supposing that two remount officers and a veterinary surgeon from the Indian Army were to visit Australia and purchase suitable horses

for the different branches of the Service as here suggested, they would be able to do so at prices which, after paying freight, insurance, and other expenses, would be less than those which are now paid shippers for Australian horses, and the system would absorb no more, but less, money than these horses now cost the Indian Government.

The Commission then say that the only reason which can be alleged in favour of the proposal for the establishment of Indian and Imperial agencies seems to them to be that the middleman would be got rid of; but they add that as he takes the risk up to the moment of purchase in India, his elimination would be of doubtful value.

Seeing that the middlemen have in by-gone years frequently purchased horses at £15 and less, and at times still do so, for which it is presumed they got regulation prices of £40 or £45 for cavalry and more for artillery, it is not to be wondered that the breeder is anxious to get rid of the middleman; and although such extreme cases as that mentioned do not often now occur, there is no question but that it would be better, both for the breeder and the Indian Government too, if an arrangement could be made by which they could do business without the intervention of anyone between the breeder and purchasing officers.

Saddle, Collar, and Harness Galls.

On many farms operations are greatly delayed at times through horses being thrown either entirely out of work for weeks at a stretch, or being prevented from doing a full measure of work, in consequence of sore shoulders and harness galls. Of course, in young horses just broken in or horses put to hard work after a prolonged spell at grass, a certain amount of chafing is only to be expected, and where care has been taken to secure well-fitting collars and harness, and reasonable measures are followed to prevent caked accumulations of sweat and dirt, the injuries are amenable to simple treatment with astringents and antiseptics like tan juice and carbolic oil. Where the harness fits badly there will always be suffering and trouble, and the only remedy lies in the instant removal of the cause. Most people use ready-made collars and harness under the idea that it is economical to do so. Nothing could be more erroneous. It will pay to take a good horse a day's journey to a competent collar-maker, and give him double the price for harness made to properly and comfortably fit. There is no guarantee that even such made-to-order outfits may not chafe a soft-skinned horse a little at first, but after a few days it will get into shape, and there will be little or no trouble. To harden tender shoulders and backs, daily washing of the parts with tea made from oak or wattle bark is recommended as cheap and effective treatment.

Ensilage for Dairy Cattle.

M. A. O'CALLAGHAN.

THE history of ensilage would fill a good-sized volume, but the farmer will trouble himself very little about the ancient history of this method of preserving grain and green crops. We know that grain had been preserved in silos or pits in Egypt centuries ago. There is also authentic information to the effect that during the Anglo-Egyptian wars silos were discovered containing green crops preserved by this method. Of European countries, perhaps, the first to bring this system into prominence was the Austro-Hungarian Empire, whence the system developed westwards, and French experimenters and land-owners adopted, modified, and perfected this system of preserving fodder. Continuous wet seasons in England caused some English farmers to turn their attention to this method of preserving their hay crops, and in 1882 a great stimulus was given to the subject by the visit of Vicomte de Chezelles, one of the greatest advocates of ensilage in France. Perhaps the greatest enthusiasts of ensilage of the present day are the Americans, who seem to think that no dairy farm is complete without an ensilage pit or stack. At first a considerable amount of misunderstanding took place as regards the effect of ensilage on the flavour of the milk and butter produced from cows so fed. Owing no doubt to the strong fermented flavour of the ensilage itself the idea prevailed that this taint would be conveyed to the milk and butter, and, as a consequence, a prejudice arose against ensilage-fed milk in the minds of many people connected with butter factories and condensed milk factories. Personally I have seen butter made from ensilage-fed milk during the last fifteen years, and I have never known good ensilage to impart a bad flavour to the butter produced. Should ensilage become decomposed so as to almost resemble manure, then I should expect injurious results, just the same as decomposed food of any kind is injurious to the flavour of butter.

What is Ensilage?

Any fodder crops preserved in a semi-green state by a controlled fermentation will come under the term of ensilage, and almost any farm crop, except roots, might be preserved by this method. The usual method for preserving fodder crops has been to allow these crops to partially dry out in the fields and then store them in a shed, or in what is known as a rick or stack. In making hay the main points to aim at are to produce sufficient drying in the crop as will prevent fermentation to any extent setting up afterwards, and to do this without the crop having been spoiled in any way by weather influences, such as continuous rains. Many farmers dry their hay too much, and hence produce an article less nutritious than it should be;

farmers also sometimes allow their crops to become too ripe, thus changing some of the saccharine matter into woody fibre, and, needless to say, hay produced from such crops is inferior. A perfect hay is one that is cut at the proper time—that is, at the time when the plant contains the most nutriment, together with succulence, and saved in such a manner that the drying process is just carried far enough to prevent the hay fermenting to any extent when stacked later on. There is very little difference in the cutting stages for ensilage and for perfect hay-making. Both crops should be cut while green and succulent, the change in the systems begin immediately the crop is cut. Instead of allowing the crop to remain in the field for purposes of drying and preserving, it is carted at once to the silo or stack, and the process of ensilage-making begun. In making hay the idea is to prevent a strong fermentation setting up after it has been stored, whereas in ensilage-making the idea is to encourage fermentation for a time at least; the one process preserves by drying just the same as fruits are preserved by drying, whereas the other is to preserve the food in a green state by means of a controlled fermentation. The manufacture of beer is a controlled fermentation, and the beer is preserved by means of substances produced by this fermentation. Ensilage is preserved in a somewhat similar manner. It is known that the fermentation of plants is mainly due to the action of micro-organisms, and the principle of ensilage is to encourage the action of these micro-organisms up to a certain stage, and when this stage has been reached to check or destroy them. When green plants are heaped together fermentation soon begins, and the temperature increases rapidly. This increase of temperature causes a very great development in bacterial activity, and fermentation proceeds very rapidly until this temperature goes somewhat above 125 degrees F. When a temperature of about 140 F. is reached many of the organisms that have produced fermentation are destroyed (lactic fermentation now ceases), and hence fermentation proceeds more slowly until when a temperature of (say) 160 degrees is reached, when all the organisms will have been destroyed, the spores or seeds only remaining alive. Fermentation then stops, and not until the temperature decreases considerably and air gains access to the fodder can a secondary fermentation begin. Thus the food is preserved. A good-deal is heard about sweet ensilage and sour ensilage. In my opinion there is very little difference between them as a food, the sour ensilage will contain more acid and less sugar, and will be more appetising to some animals, while in the sweet ensilage less of the sugar has been formed into acid, and hence the food is slightly more nutritious. The production of either depends on the character and degree of the fermentation. The organisms that produce acid cease to do so at a high temperature, and the amount of acidity produced will depend on the length of time at which the ensilage remained at a temperature below (say) 130 degrees F. If the fermentation was slow and the heat developed slowly more acid will have been formed than if the fermentation was rapid and a high temperature quickly reached. Generally speaking, then fodder held at temperatures (say) below 130 F. will result in sour ensilage being

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produced. There is one kind of sour ensilage which is undesirable, and that is ensilage in which, during the process, a considerable amount of butyric acid has been formed. This imparts to it a very objectionable taste and smell, and makes the fodder inferior. When lactic fermentation ceases or proceeds but slowly butyric fermentation begins, provided the temperature is not too high. Under these circumstances it will be much safer to aim at the production of a sweet ensilage by filling the silo slowly, and thus allowing sufficient oxygen to remain in the mass to enable the heat-loving organisms to set up a brisk fermentation, forming considerable heat, and practically checking all fermentation and decay.

Degree of Fermentation and Pressure.

By filling slowly, so as not to cause great pressure on the bottom layers of fodder, we ensure a quick fermentation, and then by adding further fodder, we add more weight, thus shutting out fresh oxygen, and checking and controlling the amount of fermentation and heat. Thus it will be seen pressure is the main agent employed for controlling the temperature, and hence the fermentation. Ensilage can be made without pressure; but, in my opinion, no silo is complete without some arrangement for causing and controlling to some extent the pressure necessary to exclude air. When the silo is being filled it will not do to complete the filling in one day; this would cause a very slow fermentation in the lower parts, and it would also result in a silo which would be when the food had settled down perhaps little more than half full. The proper method is to partly fill the silo (say) to one-third of its height, packing it well, especially round the sides in the meantime, and then allowing it a couple of days to subside before filling again commences. This might be repeated, and the silo filled in (say) three or four stages. By this means much more fodder can be put into the silo than if it were filled in (say) one or two stages, and then when the silo is filled arises the question of pressure. If the silo is a good depth the weight of the fodder will in itself be sufficient pressure for the lower half of the ensilage, but the upper portions, especially the 5 or 6 feet near the top, will not receive sufficient pressure to ensure a proper fermentation and preservation, and as a result this portion will become mouldy, dry, and practically useless. By covering the top of the silo with some such substance as wet chaff, the air is excluded and the top of the ensilage, even though unpressed, is improved; but still further improvement will be produced if in addition to (say) covering to the depth of 1 foot with damp chaff some pressure is applied, the main thing to see being that the pressure shall be constant. Any method of pressure which requires daily attention such as screwing up cannot be constant, and hence is not so effective. I have seen ensilage pits pressed with very good results by placing planks on the top and weighting these with large stones; sand-bags have also been used for this purpose with success. Any simple method of continuous pressure which the farmer may devise will be of use, and each farmer should use the system of continuous pressure which is most easily obtainable.

Types of Silos.

There are now three well-defined types of silos. The pit silo, the overground silo, and the stack, which, properly speaking, can scarcely be called a silo. Of these, the stack system is the cheapest, but it is also the system accountable for most waste, and hence from an economical point of view it is questionable if it can be really accounted the cheapest. For the stack system it is unnecessary to chop the plants, and afterwards when the ensilage is being fed the food is easily removed from the stack in the same way as hay is removed from the hay rick. Owing, however, to the amount of waste which occurs at the bottom, top, and sides of the stack this system is seldom adopted by the very best farmers. In stack ensilage it is absolutely necessary that some good method of pressure should be utilised, and for this purpose what is known as the Johnson Press has been found to produce good results. The ensilage stack should be thatched, and, if possible, covered with a roof to protect it from the weather. Maize ensilage was made (acting on my instructions) by the Manager of the State Stud Farm by the stack method two years ago, and the result was satisfactory in every way, save that an undue amount was wasted owing to the influence of the atmosphere.

Pit Silos.

The pit or trench was the first form of silo, but in England this was abandoned by many in favour of the stack method, and the pit silos having been improved, some years ago this method of putting up ensilage practically took the place of the stack. Its advantage is a better preservation of the fodder throughout the entire mass, and hence less waste, in fact in a well-made underground silo there should be, practically speaking, no waste. In order to produce the best results in these silos it is necessary that the fodder plants should be chaffed, as this ensures a more even pressure and an easier packing throughout, besides which a much greater amount of fodder can be stored in the silo when it is cut. It is also easier to produce a first-class ensilage from such a crop as maize when it so cut than when stacked without cutting, and there is considerably less waste when the ensilage is being fed later on, as well as less labour in removing it from the pit.

Overground Silos.

A competitor of the pit silo has recently appeared in the shape of an overground silo, mostly circular, and generally constructed of wood. This style of silo (known by some as the Wisconsin pattern) was really first made in England about twenty years ago by Messrs. Reynolds & Co., and has some advantages over the underground silo. When compared with the underground silo the following points might be contrasted :—

1. *Filling.*—The method of filling the overground circular silo is by means of an elevator, whereas in the pit silo it can be carted to the edge of the pit and tumbled in, hence the filling of the pit silo is much easier than of the overground silo.

2. *Chaffing.*—For either silo best results are obtained when the fodder plants to be used for ensilage are cut with a chaff-cutter, the machine standing close to the silo.

3. *Pressure.*—From this point of view the pit silo is superior to any overground silo I have seen so far, but yet there is no reason why it should not be easy to introduce a means of weighting the ensilage in an overground as well as in the underground silo.

4. *Emptying.*—For ease of emptying the silo the overground system has an advantage over the pit, the continuous door system from top to bottom of the overground silo enables it to be emptied with the expenditure of very little labour, whereas the emptying of the underground silo is rather a laborious task.

5. *Material for construction.*—The underground silo is hollowed out of the earth, but should be lined with wood or brick, and a drain to carry off surface water made round the top of the pit. The overground silo may be constructed of timber or brick, or as I have seen and utilised twelve years ago, of ordinary stone and mortar lined with cement to give a smooth surface. This class of silo is, of course, more expensive than wood, and is not necessary in a dry climate like this, where wood of a suitable character lasts so long. The chief fault to be found with the overground silo, as used in this country, is the absence of any method of weighting the ensilage, and as a result I have seen as much as 6 feet of the top of the ensilage practically useless. This is a serious loss, and one that should be remedied. Besides this ensilage on the top being inferior, that deeper down, even to one-third of the entire depth of the silo, is not first-class, owing to the want of pressure and the access of air. A foot of wet chaff put on top to finish off the ensilage in these overground silos would be a distinct advantage.

6. *Silos of convenience.*—Perhaps the most convenient silo to construct on a farm, where suitable conditions prevail, is that which is cut into the side of a sharp hill, three sides of the silo being practically made of earth, which should be lined with timber or brick, and the fourth side or entrance should be composed of strong planks of timber held in their place by two posts footed deeply into the soil, and the planks placed according as the pit is filled, one on the other on the inside of these posts, the pressure of the ensilage from within keeping them in position until the silo requires to be emptied, when they may be removed one by one as the ensilage is taken from the top. It would be an advantage if these planks were tongued and grooved so as to exclude all air possible. The advantage of a silo so constructed would be that the ensilage could be carted round the hill and tumbled into the silo, and later on when it required to be emptied, the cart could be backed in at the entrance, and the ensilage forked on to it, removing the planks forming the doorway or entrance, according as the depth became less and less. Such a silo would have all the convenience and advantages of the overground and pit silo combined. For those about to construct a silo, I cannot do better than advise them to refer to the excellent article on the construction of silos in the *Agricultural Gazette* number of September, 1902, by Mr. A.

Brooks. One thing to remember in the making of ensilage is that the crop must not be put in at too dry a stage, otherwise there will not be sufficient moisture to produce a proper fermentation, and the ensilage will be dry and tasteless. If through any means it becomes necessary to make ensilage from a crop that has been allowed to go too far and become too dry, it would be wise to spray the fodder with water, as the ensilage pit is being filled. This will help to produce the necessary fermentation, and a good effect will result; but, of course, the ensilage cannot be expected to be anything like what it would have been had the crop been cut when it was in a green succulent stage. Of all crops maize, perhaps, makes the best ensilage for the dairy-farmer, but in years of plenty there is no reason why fair ensilage should not be made from meadow grass. I have seen excellent ensilage made, and, in fact, superintended the making of some from meadow grass about twelve years ago. It was eagerly eaten by milch cattle, and was equal to hay made from grass. As a comparison between hay and ensilage the following analyses and remarks are of interest:—

The analyses were prepared by Mr. Ralph Betley, the public analyst to the borough of Wigan. The samples of clover, hay, and ensilage which were analysed were both grown on the same field this year, the hay being the first crop cut at the end of June, and the ensilage the second crop cut in September.

Analyses.	Dried at 212° F. Hay.	Ensilage.
*Albumenoid substances soluble in water	2·87	7·55
†Albumenoid substances insoluble in water . .	7·83	4·89
Sugar, gum, and extractive matters...	47·31	53·44
Fatty matters, chlorophyll, &c.	2·96	3·11
Indigestible woody fibre	32·84	22·16
Mineral matter soluble	2·51	5·71
Mineral matter insoluble	3·68	3·14
	100·00	100·00
*Containing nitrogen	0·46	0·28
†Containing nitrogen	1·25	0·75

"*Report.*—The hay had all the characteristics of good clover and rye-grass hay; the ensilage was much darker in colour than the hay, and was very odoriferous, having a faintly acid smell, accompanied by a very persistent smell of essential oils. The smell was entirely absent from the hay, and this difference will form one reason why the ensilage is so liked by the cattle. The analyses show, however, that besides this, a change is produced in the silo, due in great measure no doubt to the partial fermentation which is set up there, and which beneficially affects the food value of the product as compared with hay. This change results in:

1. An increase in the amount of soluble albumenoid substances, or flesh-forming compounds.
2. A decrease in the amount of indigestible woody fibre, which, of course, means an increase in the total amount of digestible matter as compared with hay.

The liquid which drained from the ensilage was glutinous, slightly acid, and possessed a smell of essential oils, like the ensilage did. It may be mixed with food or drink for cattle or calves."

Rainfall Analysis.

JOHN BARLING,
Upper Manilla.

THIS paper is intended to be supplementary to the one given in the August number, on the rainfall of this State. In that number it was sought to be shown that there was a very apparent regularity in the Sydney rainfall. This paper, with its diagram, seeks to show that there is a great similarity in the rainfall of all parts of the State.

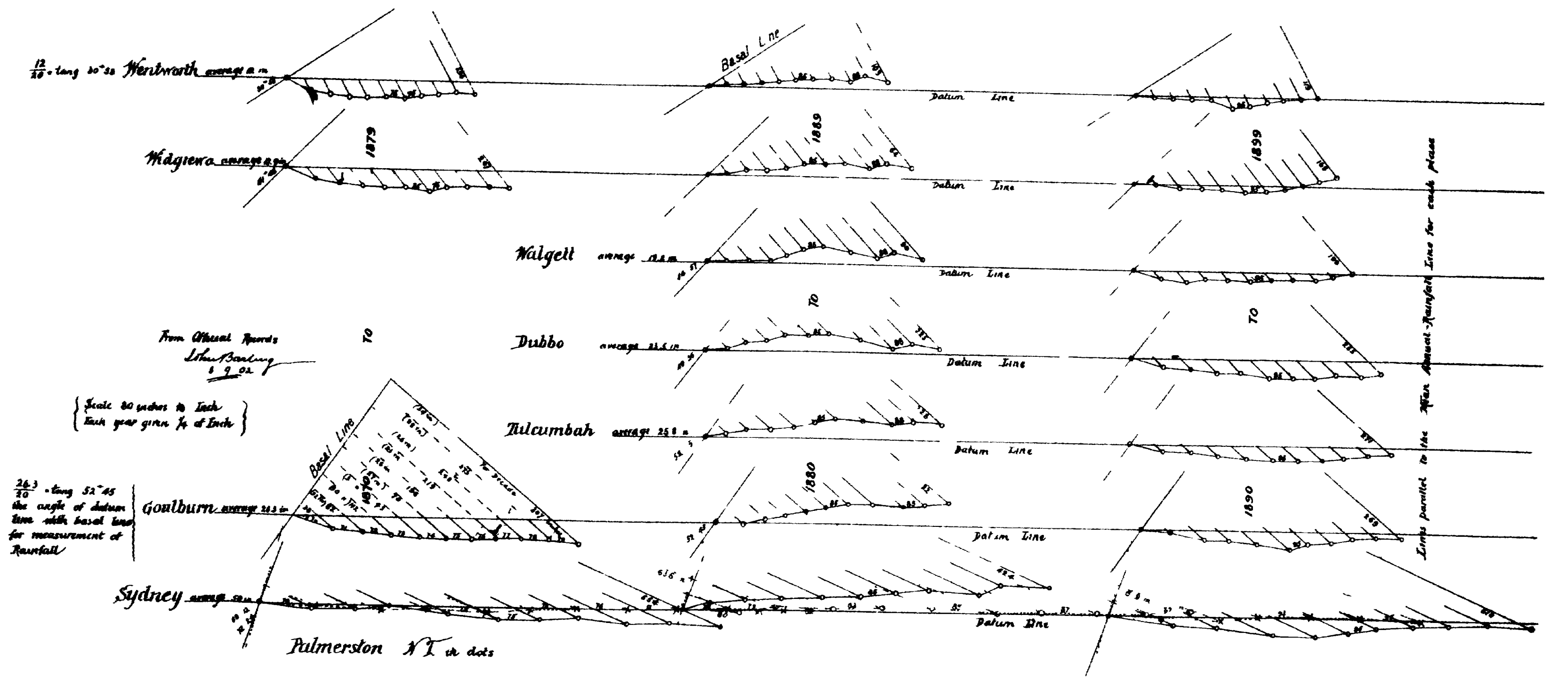
Still keeping up the ten years periods, and starting at 1870 (see diagram A), by making datum-line for each place, the line which would be shown for the average rainfall for all years for that place, and then plotting each year's rainfall for the ten years period, it will be seen that as any one plot shows above or below its datum-line, so does the plot of the rainfall of any other place show correspondingly above or below its datum-line for the same period.

To make this more plain, the plot for Goulburn for the '70s will show in detail the method adopted in each case. Take the plot as shown on diagram for Sydney: On this, it is assumed that its average annual rainfall for all years is 50 inches. Then, if each year had an exactly equal rainfall, the plot would show as a series of marks at equal distances on the datum-line. But the yearly rainfall being very unequal, each year's plot is generally above or below the datum-line. If the year's plot is parallel with datum-line, either above or below the line, the rainfall for that year has been an average one, that is, 50 inches. According as the year's plot is inclined to the datum-line, either upwards or downwards, so was the year's rainfall less than 50 inches, or more than that quantity. Plotting accordingly, for other places than Sydney, this remarkable fact appears, that for 1870 to 1879—a maximum period—all places show their plot to be below their datum-line. From 1880 to 1889—a minimum period—all places show their plot to be above that line; 1890 to 1899 again below the line. The places shown may be taken as typical of New South Wales. There thus seems to be both regularity and similarity in the rainfall over all New South Wales, and how much further this apparent rule holds it will be interesting to inquire.

The sketch B given, shows that with extraordinary differences in the rainfall at such widely separated places as Palmerston, Strangway's Springs (Lake Eyre), and Sydney, there is also a strong family likeness in their plots.

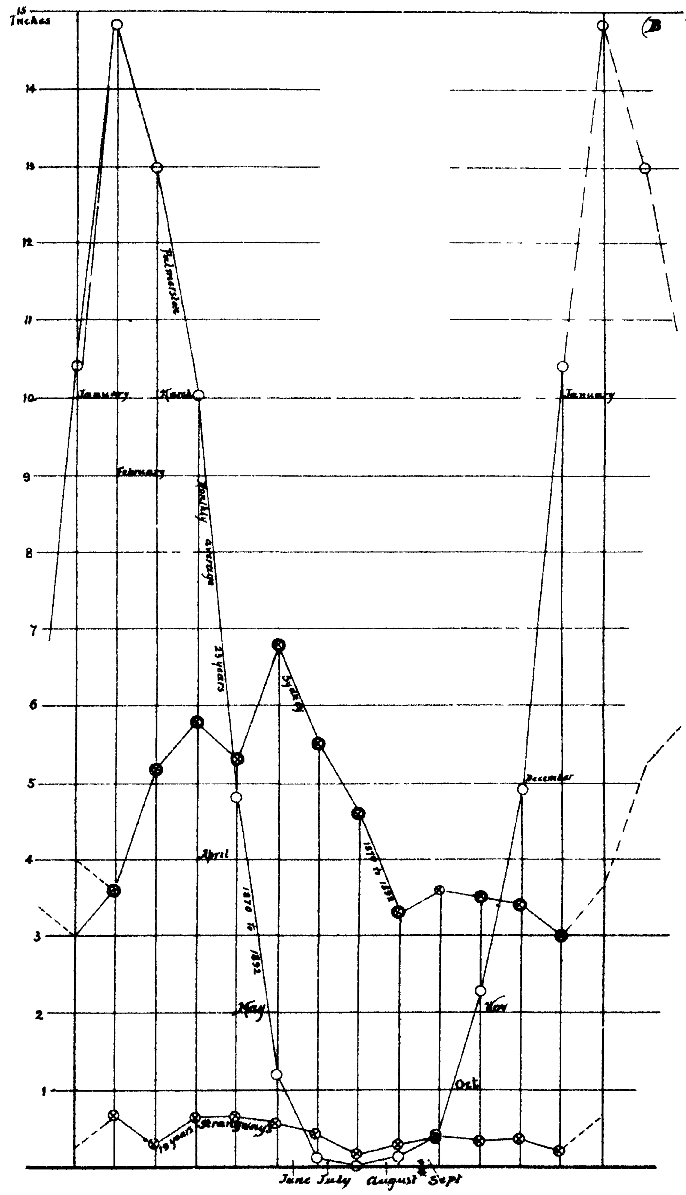
That there is a rainfall system or systems the world over seems most reasonable to expect.

Is it not quite likely that in Egypt where the measurements of the Nile floods, which is the rainfall of a large part of the earth's surface, have been made from time immemorial that Joseph in ancient time



A. *DIAGRAM showing the similarity of the Rainfall over all New South Wales*

From the Official Records.
JOHN BARLING.
6-9-02



B. *SKETCH showing the Average Monthly Rainfall at Palmerston N.T., Sydney, and Strangways, and that, with extraordinary differences, there is also some similarity in their plots.*

was well acquainted with such a system? Is it not probable that Nilometer records are in existence still; and if so how invaluable they are! Amongst the treasures still to be discovered in the wonderful land of Kemi none would be more valuable than these. The good use that Joseph made of his knowledge need not be referred to here, other than that it affords an incentive to continue the search for such certain information as he apparently possessed—for probably drought, and consequently "Low Niles," was the cause of the terrible famine recorded But even with our present scanty knowledge of climatic conditions in this State, it seems certain that by conservation of fodder which can be grown in abundance during favourable seasons—even as in Egypt—and these seasons are not so few and far between as some suppose, even in the driest parts, such appalling losses of stock as have occurred during the past continuous dry seasons might, in a great measure, be very largely prevented, even without artificial irrigation. It would appear by the published accounts that Egypt has had "Low Niles" for some seasons past, presumably this means a low rainfall for its watershed, similar to our experience lately. Over how large a part of the earth's surface do these dry periods synchronize?

Referring again to our region of minimum rainfall, "Lake Eyre," it would appear as if some natural mighty "Dry-air Centrifugal" or Radiator were always at work there, with gradually diminishing force keeping back the moist conditions of the atmosphere prevailing near the sea, and which might otherwise spread inland.

If it be found practicable to admit the sea to this great depression, as is now proposed to be done, would the Centrifugal's or Radiator's influence cease?

In conclusion, it seems by the various diagrams given, there is strong reason for thinking that the whole of the State has entered, or is about entering on a much more favourable period as regards rainfall than has been experienced for some years past.

Flowering Plants for Honey.

In answer to inquiries as to the best plants to grow in gardens and in the field for honey-producing, Mr. Albert Gale reports:—

For Gardens.—*Salvias* (sage) in varieties. Wisteria, lupins, crocus, thyme, and other herbs; mignonette, sunflowers. Nearly all kinds of simple varieties of garden flowers for the production of pollen.

For Paddocks.—Mustard, horse-beans, cow-peas, lucerne, and all kinds of clovers, buckwheat, tree lucerne (*tagasaste*) is good for winter.

New Breeds and Varieties of Fowls.

(Continued from page 1134.)

G. BRADSHAW.

Strains versus Breeds.

POULTRY authorities, unfortunately, when writing on the various breeds of fowls, as a rule give the generally acknowledged characteristics of the breeds, without a thought or consideration whether such qualities exist. Thus fowls, at their origination as a breed, were put before the public with certain characteristics—*i.e.*, good layers or the reverse, of quick or slow growth, of meaty carcases or otherwise. These reputations have been religiously handed down from one writer to another, or, rather, one authority accepted from his predecessor statements as to inherent qualities of the various breeds and embodied them in his work, to be faithfully copied by the next party ambitious of becoming an authority on the attractive and ever fertile subject of fowls, accepting in good faith all that had been previously said; whereas, the various statements could have been readily verified or otherwise by simply keeping a few of the various breeds, or by applying to those who had bred them, and thus placed beyond the region of doubt the actual facts concerning the merits of the numerous varieties of fowls which now come under the cognomens of breeds. Had such practical tests been made by any of the several authorities, and the actual results recorded, there is not a doubt but some of the neglected breeds of the present day would be more favourably countenanced; while, on the other hand, one or two sorts that are now bred in moderate quantities would have receded in public favour, as they undoubtedly will when their present patrons become more thoroughly convinced that their reputation as profitable breeds of fowls is an unsound one. That the merits of several breeds which assisted in first bringing them into prominence is still inherent in them is quite true; on the other hand, some breeds have no claim whatever to the wonderful producing properties with which they are so frequently associated, and this is fully borne out by the results of the laying competition carried out at the Hawkesbury College during the present year, from which deductions will be made before the close of these articles. Concerning the persistency with which some characteristic is associated with certain breeds, the same applies to almost every domesticated animal, environment, climatic conditions, reversion, &c., being responsible for the lapse of some qualities and the acquirement of others. However, taken as a whole, the law of inheritance and transmission in fowls has been as true as with other animals; and when we consider the careless and haphazard way in which domestic poultry are bred and generally cared for, it is remarkable that the original qualities of various breeds have

not only been so faithfully preserved but that a considerable advance has been made in egg production and other attributes. However, the subject of useful or other qualities, whether hereditary or acquired, has to be considered apart from breeds; and, although well known to all practical men, the College competition affords a convincing illustration of the tardily accepted truism that laying is not the matter of a breed of fowls so much as of a strain or family of such breed. At the competition referred to there were about forty competing pens of six birds each. Nearly all the breeds were represented, and of some breeds there were several pens, the results of the first six months showing, as stated above, that the name of the breed had little to do in the matter, strain determining the prolificacy or otherwise, as evidenced by the fact that one pen of six Black Orpingtons produced in the six months 548 eggs, or an average of 91 for each hen for the 182 days, while another pen of the same breed, but a different owner, was low down in the contest with but 216 in the same time, all the birds being cared for and tended alike. This breed—Orpingtons—although winning the competition by laying a greater number of eggs than any other of the breeds in the contest, have never been considered as excelling all others in egg-production, but are always coupled with Wyandottes as good all-round fowls—profitable to keep for their meat and producing properties; in fact both are briefly termed the utility breeds; hence it was no wonder that a little sensation ensued when it was found that a pen of Black Orpingtons had beaten Leghorns, Minorcas, and Andalusians, and left other reputed layers far behind in the contest. This experience at the College is again confirmatory of what I have always contended, namely, that egg-production is attributable to families or strains of breeds—any breed—rather than to the breeds themselves; hence readers need not run away with the idea that because Black Orpingtons won the six months' College competition that all fowls of that breed are the best layers, but rather that the winning pen and the owner's flock, of which they form part, are a really excellent laying strain of Black Orpingtons; and whether this pen secures the same honourable position in the current six months or otherwise will not detract from the fact that this strain or family produced the greatest number of eggs during the winter six months, when such were of the greatest market value.

A further testimony to this subject of strain is the fact that other pens of this breed and colour occupied intermediate, and in one or two cases low positions; and to condemn Orpingtons as bad layers on account of some pens of these making a poor record would just be as erroneous as to assert that the breed were the best layers because one pen headed the list. In the competition, Minorcas, Leghorns, Andalusians, Wyandottes, and a number of other breeds competed, all occupying varied positions at the finish, and ranging from 91 eggs each per hen for the prize winners down to as low as 27, a difference of 64 per hen, which, calculated at a 1¼d. each, a low average for the six months commencing with April, makes a difference of 6s. 8d. in the actual results from a good and bad laying hen, this difference in the individual members, even of the same breed, determining

between the profitableness or otherwise of poultry keeping. As above demonstrated, the commercial results depend on good or bad egg-producers and how a strain to embody this characteristic can be manufactured I will now attempt to show, the following from that well-known poultry authority, Lewis Wright, serving as an introduction:—"Every desired quality which has become characteristic of a race or strain of animals is the result of repeated and continuous selection, year after year, of breeding stock which possesses that particular quality in more or less perfection. This is equally true, whether we consider some purely 'fancy' point such as the pencilling of a Hamburg pullet, or some useful quality, such as the laying of over 160 eggs in a year, or the profuse milk yield of a highly-bred Jersey cow. Such a point may sometimes occur occasionally, or as if by accident, in some individual animal; but if it occurs habitually, as one mark of a strain or family, it has been *bred* into it by many generations of selection. Some seem to think that such is not the case with wild animals; but in reality it is in their case even more so. Darwin has taught us that the 'natural selection' effected by surroundings, food, struggle for existence, and competition amongst surplus numbers, is most severe; it is unmodified by pity or caprice; and Nature does not vary her methods save in long periods and by imperceptible degrees. She does not select like man, making one choice this year and another the next, but her conditions are the same for generations, and often for ages; hence the wonderful uniformity and permanence of her patterns, as in the plumage of a partridge when uncrossed by any foreign strain. It is in this sense that the proverbial phrase of the breeder—'Like produces like'—is true. The breeding which is to succeed in producing valuable animals consists in throwing all the tendencies into one desired direction, so that the influence of remote ancestors, of great-grand parents and grand parents, as well as of the parents, combine towards the desired point. Let us take a case. It would be very easy to find a fowl which, from some cross with the Dorking generations back, and never repeated, exhibited the fifth toe. Though really due to the long back cross, such a fowl may be so rare in that farmyard stock of to-day that we may almost call it an individual variation. However, we have got it. Breeding from such a hen it is probable that a few (and only a few) of her chickens may show the fifth toe, the greater number reverting to the common type. Mating a five-toed cockerel of this produce to a five-toed pullet, the number of five-toed progeny will be increased; but still (supposing, as we have done, with no appreciable Dorking blood in the farmyard) not very many, and the four-toed progeny will still have little tendency to produce five toes. But from these five-toed chickens again select a pair to breed together. We shall now *find* the tendency much increased; probably half the progeny might be five-toed, and even the four-toed ones would produce more or less five-toed chickens. In the next generation the tendency would be so increased that probably very few four-toed chickens would occur, and in a generation or two more a four-toed bird would be as rare as the five-toed one originally was. We have

accumulated into one direction the transmissive tendencies of many successive generations, and we have now a race which we can depend upon with almost absolute certainty to produce birds with five toes." The extract just given is a full explanation of how in a few seasons some outward property hitherto foreign to a variety of fowls can be so permanently engrafted that such property will unerringly appear in the offspring. The nature of this visible property, whether it be shape, comb, colour of plumage or other attributes, frequently prompts the experimenter to call the subject of the alteration a new breed; and much less than an extra toe determines the difference between some of our present-day breeds or varieties.

Coming to invisible properties, these are just as subject to the breeder's art, some special quality being as easily bred into a race of fowls as is an outward one, and with the same certainty of transmission to the progeny; and when this inherent quality is the tendency to produce a greater number of eggs in the year than other families of the same breed, then this is what is known as a good-laying strain.

At the College competition a great difference in the laying capabilities of several pens of the same breed has been noticeable, and as some of these breeds—say, Orpingtons—are comparatively new, it will be wondered how this great divergence in producing-powers has been brought about. The following assumed case is illustrative of how such was, or can, be done:—Some years ago two poultry-breeders of this State—Messrs. Smith and Brown—hearing of the good, all-round fowls then becoming plentiful in England, determined on importing a few, which they each did from the same Old Country breeding establishment, and consisting of a cock and four hens each, the general flock in this yard being noted as a 100-egg strain, meaning thereby that a smaller or greater number of these fowls would lay, approximately, 100 eggs per year—some more, and certainly a few less. On arrival in Australia the importations were taken to their respective owners' yards, each having done away with all their other poultry stock; Smith having now secured the much-talked-of breed, considered there was nothing further to do but put them in the yard occupied by their plebian predecessors and commence breeding operations; which he did, and in a year or two had a fine collection of Black Orpingtons. The owner had, however, other irons in the fire, and no special attention was given to the fowls either in food, housing, or mating; the hens, he thought, laid well, but when asked could give no information relative to numbers. Some made their own nests and reared a number of chickens, which, with others hatched in the ordinary way and of various ages, were all brought up together; they found much of their own food, and, when hand-fed, it was irregularly done. The cockerels and pullets of all ages were allowed to run together, when, at the end of the second year, it was found that scarcely one bird of the large flock had reached the size of the imported stock, some of the latter through neglected colds having in the mean-time died. The surplus of the young birds were sold off, leaving a breeding-stock consisting of two cockerels and a number of pullets, all of which, with the survivors of the original stock, were allowed to

breed together without any regard to selection, either as to type, size, or other qualities, and not even a thought given as to whether the hens were producing 50, 100, or more eggs a year. All the owner knew was that they were good fowls, and, according to his idea, laid well.

In the meantime there were not many Orpington breeders, and Smith's yards of big black fowls having become famous, a number of eggs for setting and stock-birds had been sold to other farmers, many of whom, like himself, having secured the breed were, without investigation, satisfied with the results, until one customer with practical intention kept a year's record of three hens, with the result that the whole output for the twelve months of the three was 180 eggs, or an average of 60 each, the much-vaunted breed falling in his and others' estimation when the facts became known.

Brown, on the other hand, was a practical breeder from the start. His birds, although penned up, were given ample food of the proper sort at regular times, with the other essentials of grit, green-stuff, &c. Each hen's eggs were duly marked and daily recorded, and as is usual in all flocks, whether good or bad, some were better layers than others. The eggs from the best producers only were used for hatching, and from the progeny the same care was exercised in selecting the best layers. These in turn were mated with the most typical and sturdy cockerel from the same pens, but of a different brood. This same system of selecting the best layers was put into effect with the progeny of this second mating, the best producers being mated back to the imported male bird, and the following year re-mating to the imported hens. By this time there were several crosses of the same family, and all the issue of selection for a special purpose. The desired result—a good laying strain being now established to such an extent that the majority of the progeny of almost any mating from this flock can be depended on to produce what the laying contest has shown possible, namely, a flock of hens capable of laying over ninety eggs each in six months. The illustration is one way of producing a laying strain, and although some theoretical people may object on the principle of the evil tendency of in-breeding—and there is no doubt that there are grounds for this objection if done indiscriminately, but when practised on scientific lines it is the safest way of securing and retaining some desirable quality, and is the system which practical farm and racing stock breeders resort to when a special feature of some celebrated sire is desired in the issue. In Shorthorn cattle in England the Bates' blood is always a desideratum, and in the fairs and other market-places where such stock are offered, it is always the key to the good sale of a Shorthorn to be able to certify that it is a "Bates" from both sides, *i.e.*, Bates blood in both sire and dam. This principle is more apparent to Australians in "Carbine"-bred stock. Fleetness in the latter is the desirable quality, which was, by careful selection and breeding, implanted in the celebrated sire; and experience has shown that the issue, to a greater or lesser extent, not only proves this—that when both parents have an infusion of this blood the prepotency will be the greater to influence this peculiar quality in the offspring, but even

despite this racing property being strongly implanted, such, by neglect in dietary, training, or other causes, may become lost, the efforts which brought into existence certain qualities must, to retain them, be as consistently exercised. Just in the same way a good laying strain of fowls, no matter how well established, if getting into the hands of some, may soon become a lost quality; while, with others, it may be improved. Reverting to the illustrations *re* the making or unmaking of laying strains, there is no suggestion that the laying qualities of Mr. Ward's birds was brought about in the way I have mentioned, for it is more than probable that the generous-laying quality was implanted in them in some English breeder's yard. Mr. W. Cook's object in originating the Orpington, of which he made the Langshan the foundation, was to get a large-bodied, clean-legged, black fowl, capable of laying more eggs than any variety at that time bred; and for several years after their introduction the originator declined exhibiting, well knowing that railway journeys, show-pen excitement, irregularity of diet, and other effects incidental to exhibiting poultry would be detrimental to the cultivation of a better-laying fowl, his own words on this subject being as follows:—"The show pen will always have a strange fascination for many, the fancy will always hold its votaries in obedience, but the great future of the poultry-keeping industry does not lie here, but in the hard-headed, hard-handed toiler on the land—the farmer, the fruit-grower, the artisan, and the dwellers in cottages—and to assist these people in attempting to make their poultry pay, I brought out the Orpingtons, whose great characteristic is to produce more eggs than existing breeds; and my purpose is to continue improving them in this respect." That Cook's breed of Orpingtons justified his assertion about their laying qualities, those who have made importations from the Kent yards have frequently testified. However, there were other English Orpington specialists who are what are called show-goers. These people paid no attention to the internal qualities of the fowls, show-pen excellencies being the chief consideration. Whether the hens laid 40 or 100 eggs a year was of the very slightest importance, the winning of prizes and the selling, at big prices, of birds likely to win being the chief end. One thing is certain—both Cook's and other strains have been introduced to Australia, and it would be interesting to know whether the extraordinary good laying of one pen at the College, and the very poor records of others, could be traced to their English source; but, even admitting that all the strains of this breed imported were good laying ones, this is not enough, and there cannot be a shadow of doubt but that Mr. Ward gave special attention in one or various ways to the producing properties of his birds, for, were this not so, the laying qualities would have deteriorated more quickly than they were implanted. Mr. A. E. Henry's Wyandottes, which followed with eighty-six eggs per hen to their credit, must also have had special attention to this property, as also the Grantham Farm and Mr. Kennedy's white Leghorns, which produced seventy-eight eggs each in the six months. Bosanquets, Buff Orpingtons, and Tomb's Anconas produced seventy-four and seventy-five respectively for

each hen, all of which are good laying strains of the respective breeds—a property which has been imparted to them by the careful selection, mating, and management, either by the owners or others for this object. At the same time purchasers of stock or eggs from those mentioned, or the several others whose birds made a good record, need not think that the mere fact of buying some of the stock secures a permanently profitable lot of fowls, rather than this they have procured stock which, under favourable conditions, have proved themselves so, and by intelligent breeding, feeding, housing, and other reasonable attentions will continue good layers, wherein lies the profit.

On the same subject, a short time ago, the following question was put to Professor A. A. Brigham, of the Rhode Island Experimental Station, United States of America:—"Can a strain of fowls be developed which will inherit a capacity to produce more eggs than the best of those we now have"? The answer was supplied in a bulletin issued by the Station, as follows:—"Fecundity," which in fowls is indicated by great prolificness in the laying of eggs, is a quality which has been greatly increased in domestic animals by domestication. To-day some breeders are striving to bring their flocks up to an average egg production of 200 annually per hen. Food, shelter, care, management, and exercise, all affect the fowl's egg production; but first of all the poultry man must seek for his flock a parentage and ancestry prolific in egg production. By means of recording nests, and personal study of his fowls, he is able to select hens which are large producers of eggs. With those fowls be mates a male bird selected from the progeny of a prolific mother. The progeny of such a pen will certainly show the quality of prolific egg production, but not all of the same degree. The pullets obtained will, under like environment, and with apparent equal opportunities, show considerable difference in their egg-laying capacity, some of the female parents will have transmitted to their offspring more strongly than others the desired quality of prolific egg production, in other words some great layers among hens have stronger powers of heredity than other equally great layers in transmitting the quality of prolific laying. By the closest study and watchfulness, the poultry breeder is enabled to gradually select on both the female and male sides, birds which in the highest degree have the power of transmitting the quality of plentiful egg-laying to their offspring. Continuing this process of selection from generation to generation, there may be developed a long line of breeders possessing the predominant power of hereditary fecundity. Likewise there may be obtained as hereditary characteristics plump breasts, early maturity, fine feathers, and almost any desired shape or size of body."

Before leaving the subject, a word of warning is necessary. All the good which has taken years to implant in a flock of fowls in the way of generous egg production may be lost by the introduction of a single male bird of unknown lineage. By scientific mating, new blood is rarely required; but when such has to be used, birds of the same descent or strain from another yard should be selected.

It may now be pertinently asked what has all the above to do with Anconas? My object is to make plain the fact that a breed of fowls at its origination may have been excellent layers, and continue so to the present day, or some families of the breed may now only retain the original characteristic; or it may be that the generous-laying properties are lost, and they have become the producers of but limited numbers, and to which of the above categories Anconas at present belong, it is proposed in the following chapters to show.

(To be continued.)

Destroying Sparrows.

A number of experiments are being conducted at the Hawkesbury Agricultural College with various poisons to determine the most effective ways of destroying sparrows. The Principal, Mr. H. W. Potts, is of opinion that strychnine comes first as a destructive agent; but particular care must be taken in preparing the grain used as baits. Some people have tried vinegar to dissolve the strychnine, but the method is unsatisfactory, as the sparrows will often decline to eat wheat poisoned in this manner. So far the results at the College with strychnine-poisoned wheat have been very fair. The mode of preparation is:—

> Dissolve 1 oz. Halle's strychnine in 14 fluid oz. of absolute alcohol 90 per cent. and 4 imperial pints of hot rain-water. When the strychnine is completely dissolved, add rain-water (cold) to make up the quantity to 4 gallons. In this solution soak 1 bushel of wheat for forty-eight hours; then spread the wheat out on paper or boards to dry. When dry, keep in jars or a wooden keg in a place free from moisture.

With this stock on hand, the campaign can be commenced by scattering the poisoned grain about the place where the sparrows are accustomed to forage. Where there are poultry roaming at large about the farm premises, care must be taken not to throw the grain about promiscuously. One plan, described in this *Gazette* some time ago, is worthy of consideration. A large coop was made with two compartments. In one a couple of fowls were kept, and the other remained empty. At feeding-time clean grain was thrown into each compartment for a few days to encourage the sparrows. Then while the fowls received just as much clean grain as they would eat up quickly, there was strewn in the other compartment abundance of poisoned grain. The plan was reported to have worked wonderfully well.

Mr. Potts has examined recently the crops of dozens of dead sparrows found about the College farm, and has found in them from one to four grains of the poisoned wheat. There are several other methods of dealing with sparrows, and as the means will naturally have to be varied with circumstances, Mr. Potts will be only too pleased to advise anyone who desires to test other poisons, &c.

Malting Barley.

F. B. GUTHRIE.

BARLEY for malting purposes is at present almost entirely imported into this State from New Zealand, California, and Tasmania, a large quantity having been also obtained during the past season from Queensland, the total amount required by local maltsters being something like 200,000 bushels a year, of which only a very small quantity is produced in New South Wales. The local demand will be considerably increased in the immediate future, owing to the high duty (2s. 6d. per bushel) on imported malt.

According to the most recently published figures, the total amount of barley grown in New South Wales is a little over 100,000 bushels; but only a small fraction of this is of the kind required for malting, the bulk being Cape barley, grown for feed. When it is remembered that malting barley commands, under normal conditions, from 3d. to 6d. per bushel more than wheat, and that the average yield in New South Wales is 17 bushels per acre as against 10½ in the case of wheat, it is evident that the cultivation of barley for malting is well worth the consideration of our farmers. The grain obtained in New South Wales appears to be particularly suited for the production of malt, and is generally preferred by maltsters to the New Zealand or Californian grain.

Mr. G. S. Lintott, Manager of the Malting Company of New South Wales, which has its malting works at Mittagong, has kindly supplied me with information concerning his requirements.

This company buys about 50,000 bushels annually, which was obtained last season chiefly from Queensland, as well as from New Zealand and San Francisco. Mr. Lintott very much prefers the locally-grown grain, and has obtained samples from Tamworth and Manilla, and from Young, Wellington, Orange, and Narrandera, which leave nothing to be desired, and which contain a particularly high percentage of germinating grain, which is, indeed, a characteristic of barley grown in Australia. Similar conditions as to climate and soil as are met with in the above-mentioned districts prevail over a very wide area of the State. It is also to be remembered that barley does not require so rich a soil as wheat, nor such heavy manuring, and that it can withstand drought to a greater degree.

The greater portion of the barley at present grown in New South Wales, according to the returns compiled by the Government Statistician, is grown in the following districts:—Lower Hunter, Tamworth, Manilla, Quirindi, Scone, Muswellbrook, Narromine, Forbes, Grenfell, Young, Wellington, Orange, Tumut, Wagga, Coolamon, Narrandera, Albury, and Corowa, and on the South Coast. None is grown in the

Western Division. In Europe it is sown as a spring crop, in April or May, and is harvested in August, occupying the ground, as a rule, for a period of thirteen to fourteen weeks only. Here, where the usual practice is to sow in the autumn, about March or April, to secure the winter rains, and to harvest in December, the crop may be eaten once, or even twice, without detriment to the yield; in fact, it is said to stool better when cropped in this way. Good crops have been obtained, however, by sowing in August.

In order to produce good barley for malting, nothing further is required than that the grain shall be a good bright sample of uniform size and plumpness, running over 50 lb. to the bushel. It should be of an even light yellow colour, with a thin wrinkled skin, and of a friable texture when broken. It is an absolute essential for malting that the grain shall germinate freely.

In order to ensure an even crop, the land must be prepared with some care, broken up to a depth of at least 6 inches, and well and evenly cultivated. Heavy manuring is unnecessary; indeed, the use of nitrogenous manures (blood, bone-dust, sulphate of ammonia, nitrate of soda, &c.), is generally to be avoided, as these produce a grain rich in albumenoid matter which is prejudicial to its malting quality, beer prepared from such malt being often cloudy and unsound. Heavy nitrogenous manuring is also objectionable, as it promotes leaf and stalk growth at the expense of the grain, which is weak and deficient in starch, and flinty.

The soil best adapted to barley is a warm friable soil; calcareous loams or soils with chalk subsoil are the very best natural soils. Such are, however, rare in this State, and the addition of lime will probably be necessary to obtain the best results. Dry sandy and light chocolate soils are very suitable, and it will grow on poorer soil than wheat. Stiff clays are unsuitable.

The grain should be clean and free from other seeds, and from broken or damaged grain. Such broken grain becomes mouldy on the malting floor, even slight abrasions of the skin being liable to encourage the growth of mould, and render the grain objectionable for malting purposes. For this reason the thrashing must be carefully done, to avoid injury to the grain; indeed, it is not advisable to attempt to dress the grain too thoroughly. The grain should be harvested before it is too ripe. The best plan is to use the reaper and binder (stripped grain does not command the same price) as soon as the last trace of green has disappeared from the ears, and to let the ears stand in stooks to mature. Grain that has been stacked is preferred by maltsters, as it is then more mellow and friable.

The seed should be sown in drills, using from 40 lb. to a bushel per acre. For manure, a light dressing of superphosphate, about 1 cwt. to the acre, will give the best results, the soil having been previously limed, or about the same quantity of Thomas' phosphate.

To sum up, barley is a prolific crop, which does not require a very rich soil nor heavy manuring, and which is fairly drought-resistant. To ensure good grain for malting, the ground requires to be prepared with some care, and worked well and evenly to obtain an even grain,

and the crop should be harvested before it is too ripe, and handled and thrashed so as to avoid damage to the grain. Good malting barley always commands a good price, and the demand for locally-grown grain is considerable, both here and in Victoria, into which State large importations were made last season from Queensland and California.

In addition to its value for malting purposes, barley has a high value as a feed for farm stock. A crop that is not sufficiently uniform in quality for malting is, nevertheless, a valuable crop, and commands a price not much inferior to malting barley, and is of far higher feeding value than wheat screenings, especially for horses.

The straw is also of high value, and it is a profitable farmer's crop, even if the grain produced should fall short of the standard required for malting.

Dressings for Lucerne.

The common idea that lucerne, being a leguminous crop, is independent of artificial dressings for its supply of nitrogen, is not confirmed by the results of some experiments conducted by Dr. Bernard Dyer, and described by him in the Journal of the Royal Agricultural Society. On the contrary, a liberal quantity of nitrate of soda was of the utmost significance in increasing the weight of yield. This result may have far-reaching issues in connection with the growth of lucerne, for it seems that by the use of liberal dressings of nitrogenous manures land that is not naturally suited for the plant may be made to grow it on a profitable scale.

Dr. Dyer does not seek to refute the accepted truth that lucerne, like other leguminous plants, can fix and utilise the nitrogen of the atmosphere; indeed, he expressly mentions his firm conviction of the accuracy of that theory. But he contends that the plant is not capable of exercising its peculiar function independently of the condition of the soil in which it is sown. If the soil is in a high state of cultivation, both physically and manurially, supplementary artificial supplies of nitrogenous manures may be unnecessary; but, on the other hand, if the soil is poor and has not been over well farmed, the plant is so considerably hampered in its enriching operations as to remove its independence in respect to its requirements of nitrogen. Dr. Dyer found that the addition of 2 cwt. per acre of nitrate of soda to 3 cwt. or 4 cwt. of superphosphate and 1 cwt. sulphate of potash gave very profitable returns, that quantity being better than 1 cwt., which in turn was preferable to 4 cwt.

Dr. Dyer suggests that the case of perennial crops like lucerne, in regard to the question of self-fertilisation, differs materially from that of rotation crops, such as clover and beans. These latter have the important advantage of a good start in a well-prepared soil usually containing the residue of previous manurial dressings, whereas the permanent lucerne is left absolutely to its own resources.—*Cable.*

The Cultivation, Preparation, and Marketing of Raisins in Southern Europe and in New South Wales.

Now that attempts are being made by local growers to cater for the big demand there is in New South Wales for preserved fruits, it is thought that some particulars of the methods employed in the production of raisins in countries famed throughout the world for such products, may be found instructive. The report from which the information is taken was published in the *Bulletin de l'Office de l'Algerie* by the French Government in July last.

It will be noted that the bulk of the fruit for preservation is grown in the coastal regions of the Mediterranean. We have in parts of our Central and Western districts the same conditions of prolonged periods of uninterrupted sunshine to thoroughly and evenly ripen the fruit, and to permit of the open-air drying, which is, for commercial reasons, essential in raisin-making. It will be also observed that raisin-growers in the Mediterranean littoral enjoy the apparent advantage of ample labour of an inexpensive character. It must be remembered, however, that in many of the countries of Southern Europe it takes quite a host of people to perform operations that a single adult here can attend to easily.

Spain.

The Muscatel is the most suitable of all varieties of grapes for the manufacture of raisins; it gives the largest production, and of the best quality.

In temperate climates the Muscatel prefers fresh, slightly sandy, or calcareous soil; but also likes the coastal regions, which hasten the maturity of the grapes, an important condition of success. When properly looked after and planted under the above conditions, this vine gives a good crop. It will grow equally well in light clayey soils, if fresh. The stocks are planted at a distance of 6 or 8 feet from each other, and in the first case there are 2,500 plants to the hectare (equal to 1,000 to the acre); in the second case, 1,600 to the hectare (equal to 650 per acre). The latter is the best system, as it ensures better ventilation, and affords less chance for the spread of disease. The cuttings, which should be about 30 inches in length, should be placed about 12 to 16 inches deep in the soil in a hole of similar width, and 20 to 24 inches long. After being firmly set, they should project from 6 to 8 inches. The best fertiliser is stable manure, which should

be well mixed with earth, but must not touch the plant. The cuttings should be chosen from a young, strong, and healthy vine, cut in December, and placed in the soil at a depth of about 20 inches, which will protect them from the cold; then well watered until February, when they should be transplanted. The plant should be maintained at a height of 4 to 6 inches above ground, and all higher shoots must be cut off. A single bud is left the first year, and the ground should be ploughed several times during the first two seasons, particularly in the summer; and care should be taken to stir up the soil round the plants at least once each in the winter and summer, to prevent the attacks of insects and growth of weeds.

The cost of planting 1 hectare (2½ acres) of vines is about 330 pesetas (£13 1s.).

The cost of cultivating the same area amounts during the first year to £16 2s., to which must be added the second, third, and following years the cost of 1 cwt. of sulphur per hectare, which, with labour added, may be estimated at 12s. These figures refer to Spain, and naturally do not correspond with those elsewhere. They are only given as a guidance.

The pruning should be done in December (in Spain). The plants thus cropped should have two buds left the second year, or three at the most, which will form the branches which bear the grapes. The third year, three to five buds can be left, according to the shape and development of the plant, and also according to the quantity of manure used. When the pruning is finished, the plough is passed over the ground three times in winter, and twice in March, suspending operations at the end of June. The lopping off takes place when the vine is in flower, and only two branches must be spared on an average, because the Muscatel covers all those which remain, and if crowded, the quality of the grape becomes inferior. The sulphur should be spread in April by means of a special machine, and at the rate of 56 lb. per hectare, as a maximum.

This prevents certain diseases, and especially black rot. During June the vines are examined, in order to free the stock, so as to prevent any contact of the branches with the soil, and consequent loss of grapes. With this object, some of the branches should be raised.

In the Valenciennes district the vintage takes place from the 15th to 31st August. At this period, the grapes which are well exposed, take a ripe colour, and the taste reminds one of cinnamon. The harvesting is generally begun when certain of the berries begin to wrinkle. These are the ones which have no seed. Mush or willow baskets with a maximum capacity of 44 lb. are used for placing the grapes in, and when filled are carried on waggons to the place where they have to be heated. Great care has to be taken not to pile the baskets on top of each other, and particularly not to crush the grapes, as this would ruin them for curing purposes. For the same reason care should also be taken not to empty the baskets on to the ground; and it is, therefore, necessary to have a sufficient number at hand. At a place as near as possible, a brick stove is built, which contains

a boiler. This should be made of galvanised or cast iron, and hold from 40 to 50 gallons at least.

The boiler should be placed in the centre of the furnace, which has a double depth, in order to increase the draught, and the edges should project 6 to 8 inches round the boiler.

The following apparatus are required for the manufacture of raisins:—One boiler (size mentioned above), a sieve of galvanised iron, capable of holding 22 to 33 lb. of grapes; another sieve of smaller dimensions, used for skimming the lye; twelve osier baskets, with large handles, for the transport of the grapes after the dipping; a blacksmith's poker for the fire; a reservoir of pure water, if there is not running water, or a well; a tank of lye; several layers of rushes or willows used in the drying; several small tents for protecting the raisins during the night; small wooden blocks, about 2½ inches square; and finally, baskets of fine palm leaves, for holding the dry grapes.

The lye is prepared in an open tub, in which has been placed wood ashes 75 per cent., to 25 per cent. of powdered quicklime. These two should be well mixed and sufficiently stirred. Pure water is poured over this, which, after partially filtering through the mixture, is drawn off by an opening at the bottom of the barrel. This liquid, at the first passage, gives a superior kind of lye, which is reheated and preserved in air-tight vessels. Water can be added twice successively to this mixture. In the evening the drying baskets are placed in the most elevated position possible, and shelters shaped like tents placed over them.

The baskets are in two rows of five, one on top of the other, separated by the small wooden blocks at each corner, with one in the centre to prevent the grapes of the top row touching those below, and also to facilitate ventilation.

On the day of the operation, when everything is ready, the boiler is filled two-thirds with pure water, 25 per cent. of the lye from the last filtration is added (this is the weaker lye), and the fire is lighted. Near the stove are placed a certain number of baskets filled with grapes. As soon as the mixture shows signs of boiling, skim the surface free from all scum with the skimmer mentioned above, and immediately afterwards plunge the galvanised-iron sieve, filled with the least ripe grapes, into the boiling liquid, where it should only remain two seconds.

A minute later the result of this first test is examined, as there ought to appear on some of the more tender berries numerous small holes, like pin-pricks. This phenomenon shows more distinctly after the grapes have cooled on the drying apparatus. If this test displays large slits in the grapes, as if cut with a knife, the lye is too strong, and water must be added to let it down; but if, on the contrary, the more tender berries do not show any sign at all after the immersion, a small quantity of the No. 1 lye must be added.

In this manner the desired result is gradually attained. The scalding will be done without interruption by using two galvanised-iron sieves, one being filled whilst the other is emptied.

One man attends carefully to the immersion of the grapes for two seconds, and empties them into the baskets prepared for carrying to the drying apparatus, where one or more women spread them bunch by bunch.

The effect of the lye shows then very plainly, and the workman ought to watch without relaxation the progress of the operation there as well as in the sieves. By-and-by, the boiling and the successive immersions cause the lye to lose its strength and purity; it is, therefore, restrengthened until the liquid has become altogether too muddy. The boiler must then be emptied and refilled, and the first process repeated. Three days after the grapes have been spread in the drying trays they are turned so as to expose the underside of the bunches to the sun; and at the end of another period of three days, part of them are converted into raisins. Those which appear still too tender are put aside.

When the grape becomes like paste when touched with the finger (this trial should be made after mid-day), the work is finished, and the raisins are taken in baskets to the store-room, where they are picked and sorted. The scalding should be commenced in fine weather, and may be carried on from daybreak up to 2 o'clock in the afternoon. Together with the sun's heat, the lye completes the necessary process. In the afternoon, or in rainy weather, the work is defective, as the chemical action is too feeble, and the grapes become covered with white spots, which hinders their sale and prevents them from keeping. To the scalding lye can also be added a solution of pure water and 3 per cent. of caustic soda; but in any case the first test mentioned must be made, as it is difficult and imprudent to depend altogether on success by using a certain fixed recipe, which the varying conditions very often render unsuitable.

The chemical processes tried by a number of competent viticulturists having proved disappointing, it is best to follow the method just described. The approximate cost of scalding for a hectare (2½ acres) of vines, which on an average yield 7 to 8 tons of grapes in the province of Valencia, will be about £12 11s., including wages and the necessary apparatus. The dryers and tents are valued as follows:—

	£	s.	d.
400 dryers at 1s. 11¾d. each	39	13	0
8 tents at 31s. 8d. „	12	13	4

These ought to last about ten years, which makes the expense £12 14s. per season; thus the approximate cost of the treatment of 8 tons of grapes is £12 14s. These 8 tons lose in drying 65 per cent. of their weight, and thus only 35 per cent., or 2¼ tons, of raisins are obtained. The cost for 1 cwt. of raisins, therefore, amounts to 5s. 8d. In the province of Valencia the majority of the producers dry the grapes by spreading them on a firm soil; but in this case they run the risk of bad weather. This is bad economy, and does not compensate for the losses which this old-fashioned system inevitably occasions. The sale, even at the price of 13s. 10d. per cwt., is remunerative for the producer; but this is often increased to 19s. 8d., and even 27s. 7d. per cwt., though at one time it fell as low as 6s. 4d.

In taking as a basis for calculations 13s. 10d. per cwt., we get for $2\frac{1}{4}$ tons a result of £31 3s. 6d. per hectare, which would be paid in cash to the viticulturist by the export merchant, who buys the grapes after being dried. The latter will have to add the following charges to the purchase price :—

	£	s.	d.
Waste, say an average of 6 per cent. ...	1	17	5
Picking (from the bunch)	2	0	2
Labour, purchase of 160 boxes at 3d. each, paper for packing, lace paper, nails, stamping and ink, and storage .	2	13	7
Transport to quay, placing on board, and commission	2	18	7

The total price for $2\frac{1}{4}$ tons delivered on board, for export, would thus amount to £41 9s. 2d.

When sorted, according to the different qualities, the $2\frac{1}{4}$ tons of raisins give of the

First class, called Finest	$14\frac{3}{4}$ cwt.
Second class, called Selected	$23\frac{1}{2}$,,
Third class, called Corinth (currants) ...	$4\frac{1}{4}$,,
And waste	$2\frac{1}{2}$,,

NOTE.—It must be remarked that the growers do the planting and cultivating themselves, as well as attend to the making of the raisins, thus realising a certain profit by not employing any other labour.

The principal markets are :—

In England : London and Liverpool.

In Germany : Hamburg.

In Holland : Amsterdam.

In France : Marseilles.

In London, higher prices are obtained than anywhere else, viz. :—

First quality	35s. to 45s. per cwt.
Selected	25s. to 30s. ,,
Corinth (currants)	28s. to 35s. ,,

From these prices must be deducted from 10s. to 11s. per cwt. for freight, import charges, storage, and commission. In Hamburg the inferior-selected quality is mostly bought, and this is also the case in Amsterdam and Marseilles. The finest quality is generally packed in cases of 14 lb.; the selected, in cases of 28 lb.; the Corinths (currants) are packed in cases of both these sizes. In Malaga some specially choice raisins are packed in cases of $6\frac{3}{4}$ lb. In Valencia the best raisins are those from Catadan. Those from Denia (Alicante) are equally appreciated. The prices indicated are subject to many variations; in fact, there is no standard price. The last sales of the season were made at 18s. per cwt., f.o.b., at Grao.

Sicily.

The vines used in Sicily are the Zibibbo, the Malvasia, and the Muscatel; but principally the first, which is exported in large quantities from the Isle of Pantelleria, and the Malvasia, from the Isles of Lipari.

The system of cultivation is the same as for other species, viz.:—

(*a*) They should be planted on plains or hills, facing the sun.

(*b*) Cultivation should be done with every possible care, so as to prevent fungus diseases.

(*c*) In the summer or autumn care must be taken to give the grapes the greatest heat possible by cutting the large leaves, which intercept the sun rays.

An average good crop is 20, 25, to 30 cwt. per hectare (2½ acres), and the hectare usually contains 4,000 stocks. In order to obtain good raisins, it is essential to wait until the grapes are perfectly ripe. The harvest takes place from September 15 to 30, and sometimes lasts into the first days of October.

The rotten grapes and those which have not arrived at maturity are carefully removed, and the bunches suspended by a string to canes or sticks, supported by wooden stakes planted in the ground, in such a manner that the grapes are about 9 inches above the soil.

A mixture is prepared of one-fifth quicklime and one-fifth wood ashes passed through a sieve. This is placed in a flat-bottomed jar, having a tap on the side. The jar is half filled, then water is added until it is full. The mixture is stirred, then allowed to stand. When the liquor is clear it is drawn off and heated in a boiler. At the first sign of boiling the grapes are successively scalded for two or three seconds, care being taken to keep the liquor at boiling point. The grapes thus treated are again suspended on rods to dry in the sun in the open air; they must be frequently turned. Sometimes the bunches are placed on wicker trays on rods.

Fifteen days of fine weather are sufficient to complete the drying. During this period, the berries must be carefully sheltered from rain or dew.

The price of the raisins, especially the "Zibibbo," varies according to the market.

At Palermo, the price is considerably higher than at Pantelleria. There is a great difference between the price obtained by the producer and the price at which they are sold in the markets. The "Zibibbo" raisins are sold, retail, at 1½d. to 2d. per lb.

The producer only receives 14s. to 18s. per cwt.

The trade in "Zibibbos" is principally carried on at Pantelleria, and in the Isles of Lipari.

The export to foreign countries is almost nil, but the trade is developing in Italy, principally in Naples, Genoa, Turin, Milan, Rome, etc. Lately, a small quantity has been exported to Switzerland and Germany.

In France, the "Malaga" is the only raisin in demand. The "Zibibbo," however, does not differ very much from the "Malaga."

From Lipari, the raisins are generally exported in small barrels, or cases, similar to those used for candied peel.

From Pantelleria, they are exported in little barrels, or wooden cases, much smaller than those used for candied peel.

Generally, the cases contain 11, 22, or 33 lb.

In the cases, the bunches of "Zibibbos" are placed in layers, slightly pressed, but no paper is placed between.

Isles of Lipari.

The grapes used for raisin-making in these islands are peculiar to the country. They are black, and called *Passolina*. The stones are small. The vines are trained on low trellises.

The harvest takes place at the end of September, at which time the grape attains its full maturity. The production is nearly 40 cwt. per hectare.

The drying is carried out in the following manner:—The grapes are placed on trays exposed to the sun, which are taken in every evening. When they are well dried, they are dipped for some minutes in a hot lye of ashes. They are afterwards again dried in the sun.

The cost of drying is about 4s. per cwt., when ready for packing. The average sale price is £2 per cwt., but this sometimes rises to £4 when the crop has been small. The raisins from Lipari are principally sent by way of Trieste to Austria-Hungary, and are used for the table and for pastry.

They are forwarded in beechwood barrels containing from 150 to 165 lb. The price of the barrel is 2s. 6d., including packing.

Smyrna.

The old vines having been nearly destroyed by phylloxera, they were replaced by degrees by American stocks.

The manner of cultivation does not differ from that in other countries. The ground is first dug up in winter, and afterwards in spring to remove weeds; and the pruning is generally done in winter, and the sulphur spread in spring. The production per hectare cannot be fixed, as it depends on the nature of the soil, whether it is dry or humid, sandy or clayey, in the plains or on the hills, as well as on its aspect. The crops vary from year to year according to the temperature.

Most of the grapes ripen between July and August, and the vintage generally takes place at the end of August, but it may extend into September.

The Sultanas (without stones) and the Mosaki (large white berries with stones) are spread on the bare soil or on cloth for drying, after having been scalded in a light solution of soda, generally made from wood-ashes with a small addition of olive oil.

This preparation seems to be used with a view of hastening the drying, and for the better conservation of the fruit.

The black grapes are not treated thus because of their small value, and also because they are not always intended for table use. The price varies according to the crops and the demand from abroad. There are considerable fluctuations. The small black raisins, called *Thyra*, have been sold at 9s. 6d. f.o.b. At present, this quality is worth 18s. The Sultanas are sold according to quality, from 32s. to 95s.

The principal markets for the small black currants (*Thyra*) are France, Germany, and the Danubian provinces. For the Sultanas and the Mosaki, all the European continent, Canada, and Australia.

The black currants are packed in sacks of 1 to 2 cwt. The Sultanas and the Mosaki are in boxes of 22, 33, 44, and 66 lb., and also in bags of 66 lb.

The cost of packing in sacks is about 5d. per cwt., and in boxes about 1s. 3d. per cwt.

Ionian Islands.

The stocks used are the *Vitis Vinicola Apyrena*. The vines are placed 5 feet apart, and are pruned short. The harvest takes place at full maturity. The average yield per hectare is 3 to 4 tons of raisins, according to the fertilisers used. The drying is effected on the soil, beaten and covered with cow-dung or cut straw. The bunches are dried in the sun, and the operation requires from six to ten days, according to the weather. The cost per hectare is from £8 to £10. The selling price is very variable, and depends more or less on the abundance of the crop as well as the quality, which in its turn depends on the state of the weather during the drying. However, an average price is about 8s. to £1 per cwt. The principal markets are—England, Germany, America, and all countries where currant cakes are greatly consumed. For packing, boxes and barrels are used for the superior qualities called dessert raisins, and bags for inferior qualities, such as are only used for the distillery or for the manufacture of wines.

New South Wales.

The following is from an article by the Fruit Expert, Mr. W. J. Allen, in the *Agricultural Gazette*, November, 1899, and March, 1901:—

Raisins.

"It will be found that the best raisin grapes are grown on the lighter and richer soils.

"To make a good table raisin, the grape must be grown to perfection—that is, the grape when ripe should be large, thin-skinned, fleshy, and containing plenty of sugar, and the bunches must be well filled, the larger the cluster the better the appearance of the fruit will be.

"For making either pudding or table raisins, be sure that the fruit is perfectly ripe before picking, as for the latter purpose an under-ripe grape, when exposed to the sun, will turn red (in most cases), and will also take longer to dry than a ripe one, and when dried will be a sour and inferior raisin.

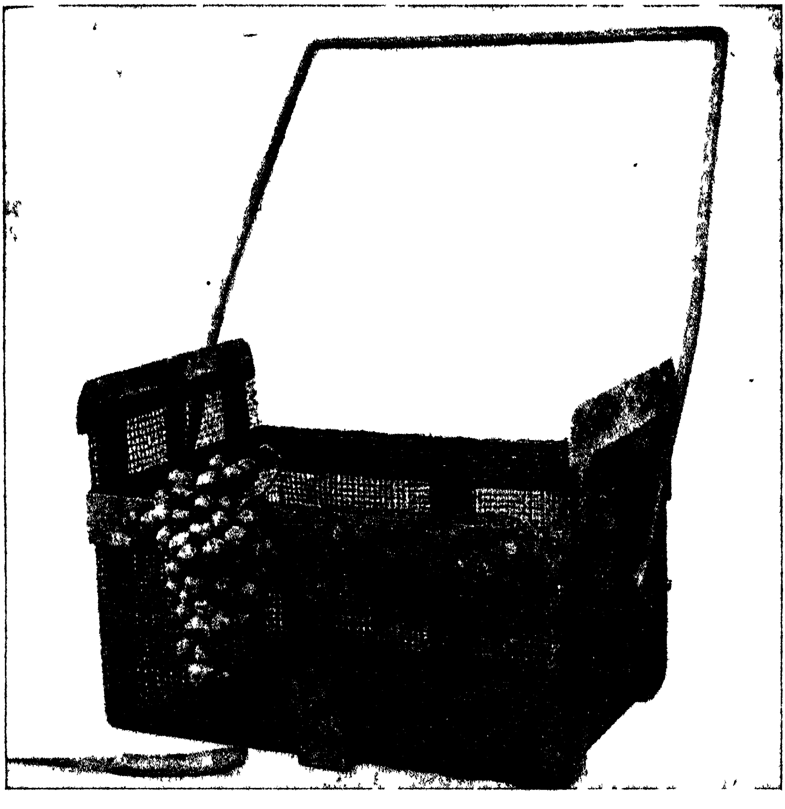
"The only grapes which have so far produced a good commercial raisin in Australia are the Gordo Blanco and the Muscat of Alexandria. I have had samples of raisins sent to me made from other kinds of grapes, which did not present a bad appearance; but if the grower placed these on the market to compete with the raisins made from the Gordo and Muscat, he would find that they would not sell so long as the latter were obtainable.

"The process of curing the table raisin is as follows:—Pick the very best clusters—that is, only such as are well filled with large, fine grapes—cut out all damaged or hard grapes, and lay the bunches carefully on the trays, which are then placed in the sun. By the end of one week one side should be fairly well dried, and the bunches should now be turned. This turning is accomplished by placing an empty tray on the top of the full one. Two men can then take hold of the sides and invert the two, thus exposing to the sun the side of the fruit which had been lying next to the tray. After this turning it usually requires another week to finish the drying process if the weather is favourable—that is, dry, warm days and nights. It usually takes from two to three weeks, under favourable circumstances, to cure good layer raisins; but if the weather is damp or threatening, it is better to stack up the trays at night, covering the stacks up with empty trays. If a table raisin gets wet during the curing process it darkens the stem and spoils the bloom, and thus lowers the grade and value of the fruit. I do not consider that it will ever pay to cure table raisins in the evaporator, as they require to be dried slowly, and when exposed to a temperature, while drying out of doors, of more than 96 degrees, they will burn and thus spoil the sample. I do not consider they could stand more than 110 degrees in the evaporator, and I doubt if the green fruit could stand even this temperature without it having a damaging effect. Therefore, I would not recommend growing grapes for raisins in a climate where the evaporator would have to be resorted to.

Pudding Raisins or Lexias.

"Grapes intended for this purpose should also be picked when fully ripe. All partially ripe and dried fruit should be removed, and the grapes placed in a dipping-basket, and immersed for about three seconds in a lye made in the proportion of 1 lb. of caustic soda to 8 gallons of water; and this *must* be kept just under the boil, as the dip will lose its effect if the lye is only fairly hot, and the fruit, instead of turning out a nice golden colour, would be brown. This, however, is not always the cause of the raisins being brown in colour, as it is impossible to make a good, bright Lexia, or good quality of raisin of any sort, from grapes grown on some of the heavier or stiffer

soils. After the dipping process, it usually takes from five to eight days for the fruit to dry, this depending on the weather. About the fourth day after dipping, the grapes should be turned; but do not allow the fruit to become too dry before taking it in; a nice, pliable fruit being always the best. If there is any uncertainty as to whether the fruit is sufficiently dry or not, it can be tested by squeezing a few



Dipping Basket

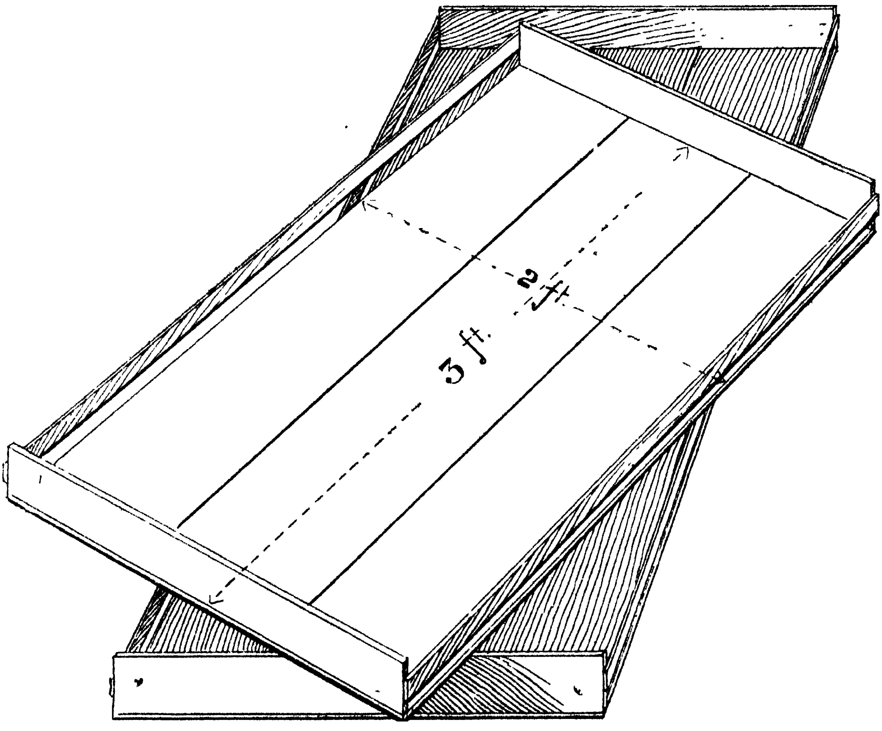
This is made of strong galvanized wire, ¼ in. mesh and bound with hoop iron, and so made that it revolves inside the handles, thus making it quite easy to empty the fruit out into the trays after it has been dipped. Such a tray is suitable for dipping prunes, sultanas, muscatels, &c. The size is about 2 in. longer and 2 in. wider than an ordinary kerosene tin.

of the raisins between the thumb and finger; and if no moisture exudes, then the fruit is quite dry enough. The Lexias should be stemmed and graded as soon as possible after they are dry enough to remove from the tray to the sweat-box, as, if allowed to stand any length of time, the stem becomes toughened and hard to separate from the raisin.

Drying-trays.

"These are made with either three or four boards. I prefer the three boards, as there are not so many cracks, which is an advantage in curing small fruits such as sultanas, currants, &c., and they appear to hold together better.

"A good tray is made as follows:—The ends or cleats are made $2\frac{1}{2}$ inches wide and $\frac{7}{8}$ inch thick; the three boards $\frac{1}{3}$ inch thick are then



Drying Tray.

This is the size of tray which is in general use for drying raisins, apricots, peaches, sultanas, &c. When prunes have to be dried on them it is best to nail a cleat along each side to keep the fruit from rolling off during the time of filling and handling the tray. Size, 2 ft. x 3 ft.; end cleats, to which the boards are nailed, $\frac{7}{8}$ in. x $2\frac{1}{2}$ in. x 2 ft. Trays are made with three boards, $\frac{1}{3}$ in. thick, 8 in. wide, and 3 ft. long.

nailed securely on these cleats by driving four nails in each end—nails to be 2-inch round wire nails with flat heads. Such a tray as this is useful for any fruit drying in the sun, and can also be used for storing lemons and oranges by placing in sweat-boxes with a layer of fruit on each.

"In drying fruit, these trays, when necessary, can easily be stacked one on top of the other, and the stack covered with two empty trays to keep the rain off.

"These trays should not cost more than 7d. or 8d. each by the thousand in Sydney."

Olive Oil Tests.

W. J. ALLEN.

During the year 1900 I had some of the varieties of olives growing at the Wagga Orchard tested to ascertain which were the best varieties to grow for oil production, and to determine the difference, if any, in the yield of oil from a given weight of fruit of each different variety. I am pleased to have to report that we have found other varieties which yield a good quantity of oil, and which should be well worth planting for the purpose of converting the fruit to this use.

It is of great importance to the grower that he should know of varieties which will yield gallons of oil where others will produce only pints and quarts, as it is expedient that only the greatest oil-producing varieties should be planted in order that growers may be in a position to successfully compete with other States and countries.

In the previous experiment one of the tested varieties happened to be untrue to name, viz., the Bouquettier. In testing other trees of this variety we found its oil-producing capacity below the average, and that the tree labelled with that name and from which the tested fruit was taken was in reality the Pleureur and not the Bouquettier, and which has again come out a tie with the Correggiola.

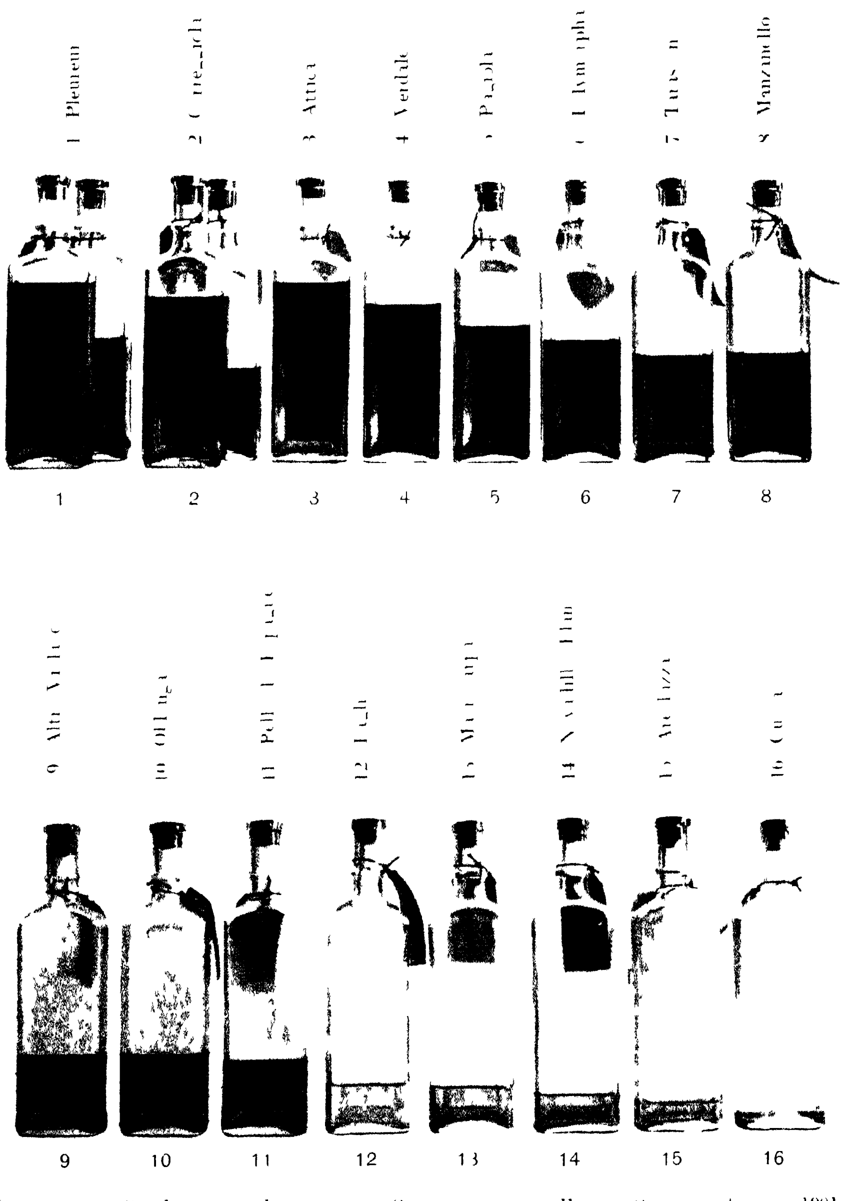
In the illustration now reproduced the Pleureur variety (previously misnamed Bouquettier) is shown in Fig. 8.

It will be noticed, on reference to the illustrations, that the quantity of oil from the Correggiola and Pleureur is about equal, there being three bottles of oil from each variety, the yield of oil this year being even greater than two years ago. Following these two, and next in order of merit, is the Boutillane, which leads the Pigale by a little, Dr. Fiaschi following next. Gros Redondeau may be classed among the low-grade olives, while Amellau, Bouquettier, Macrocarpa, Cucca, and Blanquette are not worth planting as oil-producers.

For pickling and oil the Correggiola and Pigale; the latter variety, however, with us this year has been rather a light cropper.

The following is the order of merit of the different varieties which so far we have tested, and which would be worth a place in the orchard, viz.:—Correggiola, Pleureur, Boutillane, Pigale, Dr. Fiaschi, Verdale, Attica and Gros Rodendeau, the latter, however, can only be classed as a low-grade olive for oil production but a fair size for pickling.

I hope to repeat these experiments for another two or three years, in order to ascertain if the yield varies very much from year to year, and to find out which of all the olives we are growing in this State are the best oil-producing varieties. I may say that Mr. Thomas Hardy, of South Australia, has a seedling which he has named Hardy's



Comparative Oil Yields of Varieties of Olives tested at Wagga Orchard. Season 1901.

PLATE I.

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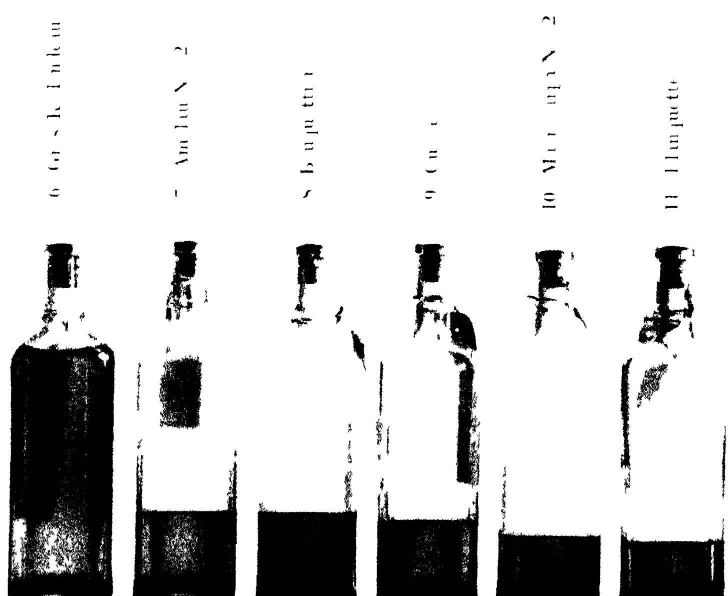
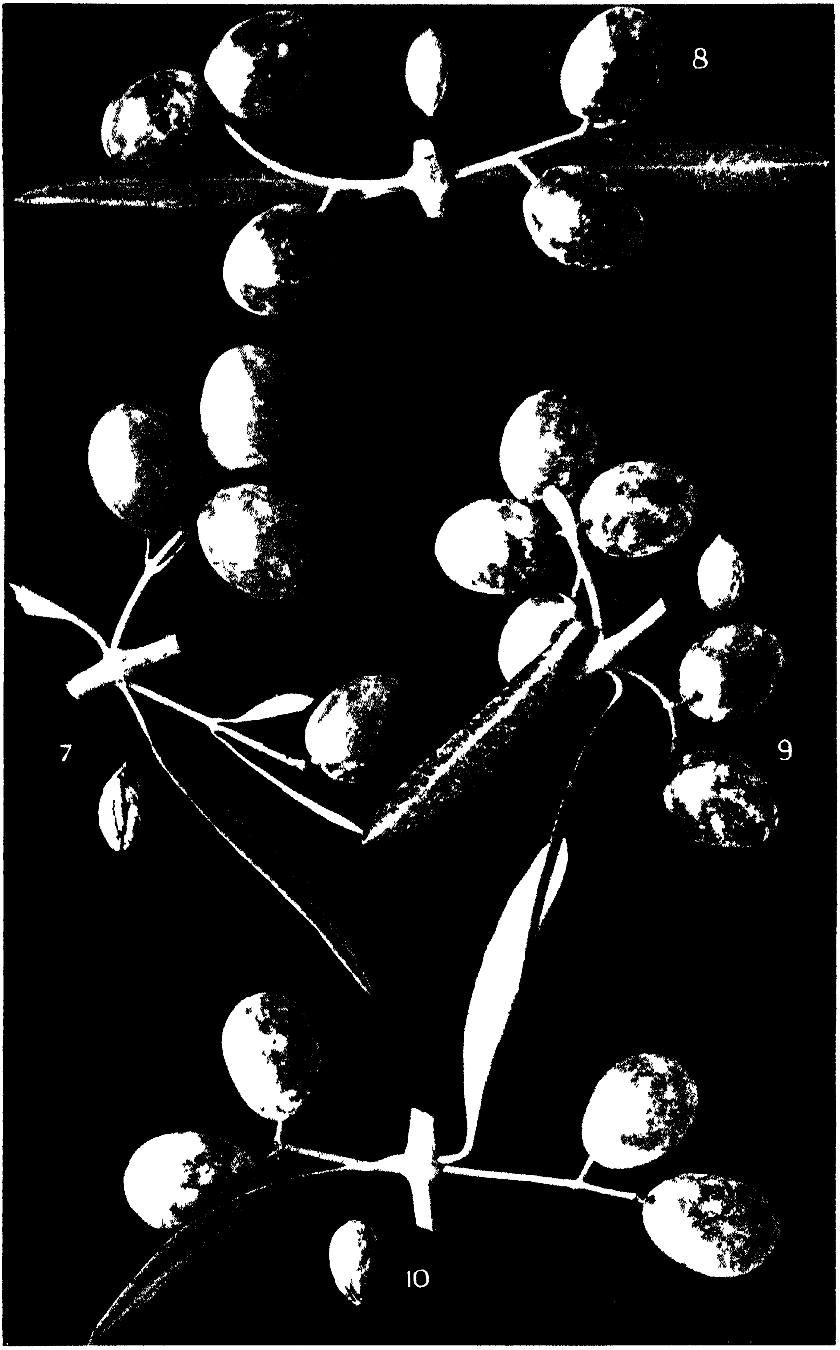


6 7 8 9 10 11

COMPARATIVE OIL YIELDS OF VARIETIES OF OLIVES TESTED AT WAGGA ORCHARD, SEASON 1902.

PLATE II.



OLIVES AT WAGGA ORCHARD.

The variety Fig. 8 is Pleureur. In the *Agricultural Gazette* for December 1900, in which this illustration first appeared, the variety is called Bouquettier in error. The other varieties shown — 7, Columella; 9, Arecluzza; 10, Ragiola—are not of special value for oil production.

Mammoth, which is of the largest size, a good cropper and a particularly good oil-producing variety, and very well worth a place in any orchard.

The following table has been kept by Mr. Hogg, the Orchardist at our Wagga Orchard, and gives the date upon which the olives were picked and crushed, the number to make up one pound, together with the weight of oil each variety produced.—

Varieties	Date of Gathering	No to lb	Weight of Oil	Remarks
Macrocarpa	4 June	179	1½ oz.	Heavy crop.
Amellau	6 ,,	78	2 ,,	,, ,,
Pleureur	8 ,,	160	14 ,,	Small ,,
Pigale	10 ,,	90	11 ,,	,, ,,
Dr Fiaschi	12 ,,	254	9 ,,	Medium ,,
Gros Redondeau	19 ,,	129	6 ,,	Small ,,
Bouquettier	23 ,,	308	2 ,,	Heavy ,,
Correggiola	28 ,,	132	14 ,,	,, ,,
Boutillane	3 July	200	11¼ ,,	Medium ,,
Blanquette	5 ,,	248	1 ,,	,, ,,
Cucca	10 ,,	104	1½ ,,	Heavy ,,

In glancing over the table showing the quantities of oil taken from a given number of pounds of fruit it will be seen how easily one can go wrong in planting, as in getting a poor kind it would be impossible to make olive-growing pay, whereas with the best oil-producing varieties one would at least, other conditions being favourable, have a fair chance of competing in the open market.

Latakia (Lattakia) Tobacco.

Although the tobacco usually grown in New South Wales is of a rather heavy nature and more adapted for manufacture into a cheap plug article, experiments carried out from time to time have demonstrated the suitability of the climate and soil of several districts for the growth of the most delicately-flavoured tobaccos.

Some years ago an excellent class of cigarette tobacco was grown at the Departmental tobacco plantation at Moonbi. A bulk sample of this leaf was, on being cured under expert supervision, handed over to one of the leading Sydney tobacconists, who had it made up into cigarettes. Everyone who smoked those cigarettes was struck with their excellence—indeed it was almost impossible for the keenest connoisseur to detect any difference between the Moonbi cigarettes and the most expensive imported smokes. In cigar tobaccos, too, some encouraging results have been obtained, and there is no doubt that if anyone were to set about the production of the higher grades of pipe tobaccos in light sandy loams, instead of the heavy alluvials in

which bulk is obtained at the expense of quality, a leaf could be produced equal to almost any of the standard imported brands of plug tobacco. One of the most popular of high-grade tobaccos, now-a-days, is the Latakia. With the object of determining whether it could be grown successfully in this State, a communication was forwarded to His Majesty's Consul-General at Beirut, in Syria, asking for information as to the methods of cultivation and curing of the Lattakia variety of tobacco, and for a sample of the seed for trial purposes. The report of His Majesty's Consul-General, with a sample of seed, has now reached the Department through His Excellency Sir Harry Rawson, K.C.B.

Report on the cultivation of "Abou-Riha" tobacco—("Latakia" is a trade name after the district of Lattakia in which this variety is principally grown) :—

"The cultivation of Abou-Riha tobacco is the same as that of other qualities of tobacco in this country, only that the young plants are taken from the nursery ground and planted very close to one another —four or five inches only are left between each two plants—and they are not watered, except at the time of planting and once or twice afterwards, according to the dryness and strength of the soil, so that the stalk remains thin and the leaf small but thick.

"After picking, the green tobacco is taken to rooms without ventilation or sunlight, where it is hung from the roof by threads.

"After thus hanging in rows at some distance from each other, the smoking is begun.

"The smoking is done by burning, in the middle of the room, the wood called 'Elozr,' a resinous and scented wood only found in the Ausaruje Mountains. The door is shut to let the leaves absorb the smoke and acquire the black or blackish colour and the scent of the 'Elozr.' This smoking continues until the month of May. When the tobacco is ready, it is taken down, lightly sprinkled with water, and heaped up to undergo a first and insufficient fermentation. Afterwards it is treated again, to complete the fermentation before packing for export.

"The tobaccos from the district of Darious, in the Ausaruje Mountains, are the best because the smoking is done entirely with the 'Elozr' wood; whereas the tobaccos from other parts of the mountains are smoked with a mixture of other woods, and are therefore in less demand."

The Consul-General adds that he is endeavouring to have the "Elozr" wood identified botanically. *Thyrax officinialis*, or "El-Hanz," is also used; it may be the same as "Elozr."

A Rapid Gravimetric Method of Estimating Lime.*

F. B. GUTHRIE AND C. R. BARKER.

In the determination of lime in analytical work, this substance is almost invariably estimated, after separation from other metals, by precipitation as oxalate from an ammoniacal or acetic acid solution by means of ammonium oxalate. The precipitate, after thorough washing, is dried and ignited and estimated either as calcium oxide or as calcium carbonate. Ignition to oxide is the method most commonly adopted. The calcium oxalate precipitate requires strong ignition over the blowpipe for at least twenty minutes, and this must be followed by a further ignition over the blowpipe for five or ten minutes in order to be certain that the weight remains constant. In cases where the precipitate is at all bulky, the complete conversion into oxide is a matter of considerable difficulty, and a common practice is to ignite and weigh as carbonate. To do this, the oxalate is ignited at a low red heat. This operation is a very delicate and tedious one, and it is a very difficult matter to avoid converting some of the carbonate into oxide. In the event of this having taken place, the precipitate is moistened with ammonium carbonate solution, dried, and ignited at a heat only sufficient to drive off the excess of ammonium carbonate. Any calcium oxide formed by the first ignition is by this means converted into calcium carbonate.

This method has the disadvantage that it requires even longer time than the other, and involves three distinct operations; igniting, evaporating the ammonium carbonate to dryness, and again igniting. The drying of the ammonium carbonate is an especially slow operation, as it has to be done at an extremely low temperature to avoid spurting.

If, however, ammonium nitrate is mixed with the calcium oxalate precipitate before ignition, calcium nitrate is formed which is readily and completely converted into oxide on ignition. Five minutes heating over an ordinary bunsen burner is quite sufficient for the purpose.

The details of the process are as follows:—The calcium oxalate, precipitated, washed and dried in the usual way, is introduced into a platinum crucible together with the incinerated filter-paper. Ammonium nitrate, previously dried at 100° C. and powdered, is added in the proportion of about 0·3 grms. to every 0·2 grms. of calcium oxalate and mixed as thoroughly as possible with a platinum wire or spatula. Heat must be applied very cautiously as the decomposition is rather violent, and the following precautions are to be observed. The crucible is placed in a slanting position and partially covered with the lid, in such

* Read before the Royal Society of N. S. Wales, 3rd September, 1902.

a way as to prevent any possible spurting, and at the same time to allow of the contents being under observation. The flame of a bunsen burner is applied *to the lid* until the mass fuses and solidifies. By this means it is very easy to regulate the heat so that spurting or violent boiling is entirely prevented. The operation, using ·1 to ·2 grms. oxalate and ·3 grms. ammonium nitrate, takes from four to six minutes. The flame is then placed under the crucible for about five minutes longer, the entire operation taking about ten minutes. The whole of the calcium salt is converted into oxide, further ignition over the blowpipe being unnecessary.

In order to test the accuracy of the method determinations were made by the process described, taking pure anhydrous calcium oxalate, with the following results:—

Weight of anhydrous CaC_2O_4 taken.	Weight of CaO obtained.	Weight of CaO calculated from CaC_2O_4.
·0980	·0428	·0428
·0942	·0410	·0412
·1114	·0486	·0487
·0860	·0376	·0376
·0964	·0420	·0421
·0823	·0360	·0360
·0779	·0340	·0340
·2614	·1140	·1143
·2030	·0888	·0888
·1624	·0708	·0710
·3104	·1358	·1358
·3240	·1416	·1417

In the cases where the weight of oxide obtained differs from the weight calculated, the latter weight is always greater than the former, a difference which is undoubtedly to be attributed to the absorption of water by the anhydrous oxalate either during the process of weighing or in the desiccator.

In all the above determinations the amount of ammonium nitrate used was 0·3 grms., with the exception of the two last (over 0·3 grms. oxalate), in which cases 0·4 grms. nitrate was taken.

W. H. Hess* has described a method for the estimation of lime in which a mixture of ammonium nitrate and ammonium sulphate is employed, the lime being converted into sulphate in which form it is weighed, the addition of ammonium nitrate rendering the conversion into sulphate rapid and certain.

Ignition in a covered crucible with ammonium sulphate alone is recommended by Schrötter†, the lime being weighed as sulphate. Fresenius also‡ recommends, after strong ignition of the oxalate, the addition of a little water and solution in HCl. Strong sulphuric acid is then added in excess, evaporated to dryness and ignited. The oxalate is thus converted into sulphate, in which form it is weighed.

* Journal of the American Chemical Society, Vol. XXII (1900), p. 477.
‡ Fresenius Quantitative Analysis, Vol I (seventh edition), p. 188.
† *Loc. cit.*

AND EXPERIMENTAL FARM.

CATCH CROPS FOR GREEN FODDER AND CONSERVATION.

H. W. POTTS.

AT few periods in the history of the occupation of Australia by white men has the need for making provision for winter feed been more urgent than the present season. The demand on our food stores for next winter is constantly before us during the early summer months, and every farmer is earnestly and actively engaged in endeavouring to combat the unusual climatic conditions which, fortunately for us all, rarely prevail.

Last winter's crops failed in most districts, and our chief concern now lies in the judicious selection of quickly-growing early summer crops, such as maize, sorghums, millets, pumpkins, cow-peas, &c.

The few inches of rain which fell in October and November have been most serviceable in stimulating plant growth. One crop we have had experience of at the College farm this season deserves more than passing mention :—

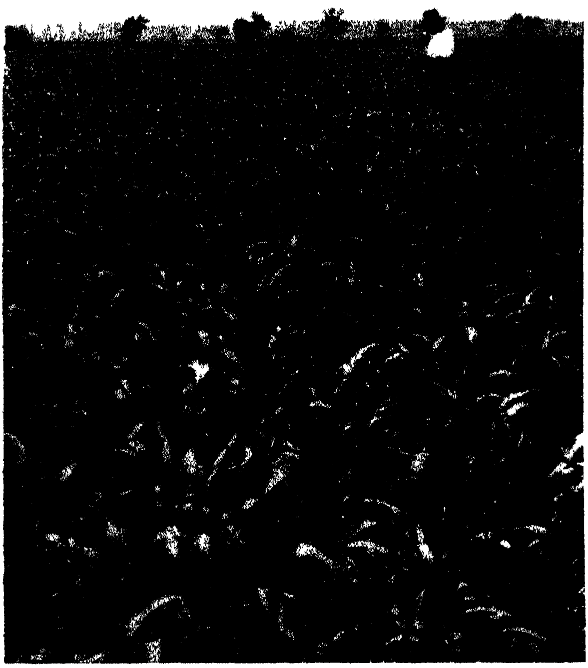
White French Millet.

A portion of a paddock known as No. 6 was prepared and sown last autumn for a crop of turnips. One hundredweight each of bonedust and superphosphate was used as manure. Owing to the failure of the autumn and winter rains the seed did not germinate, and it was decided to test the White French Millet on this land as an early summer crop. After cultivation the seed was sown broadcast, 7 lb. to the acre. From the 6th September to the 11th November, or sixty-five days, when the crop matured, we had the following falls of rain :—

Sept. 12	4 points.	Oct. 13	53 points.
,, 14	2 ,,	,, 20	64 ,,
,, 22	25 ,,	,, 25	3 ,,
,, 23	4 ,,	,, 29	83 ,,
,, 24	3 ,,	,, 30	46 ,,
,, 27	88 ,,	,, 31	16 ,,
Oct. 7	2 ,,	Nov. 1	11 ,,
,, 12	19 ,,	,, 9	71 ,,

making a total of 5 inches.

The land is poor sandy loam and undrained. On the 11th November, when the accompanying photographs were taken, the crop was fit to cut, and ranged from 3 to 4 feet high. The well-laden seed panicles in their green and succulent stage were very prolific, the broad, leafy foliage was at its fullest development, and the sturdy and juicy stems contributed in no small degree to build up a forage plant eminently suitable at this time of the year for green forage, hay, or ensilage.



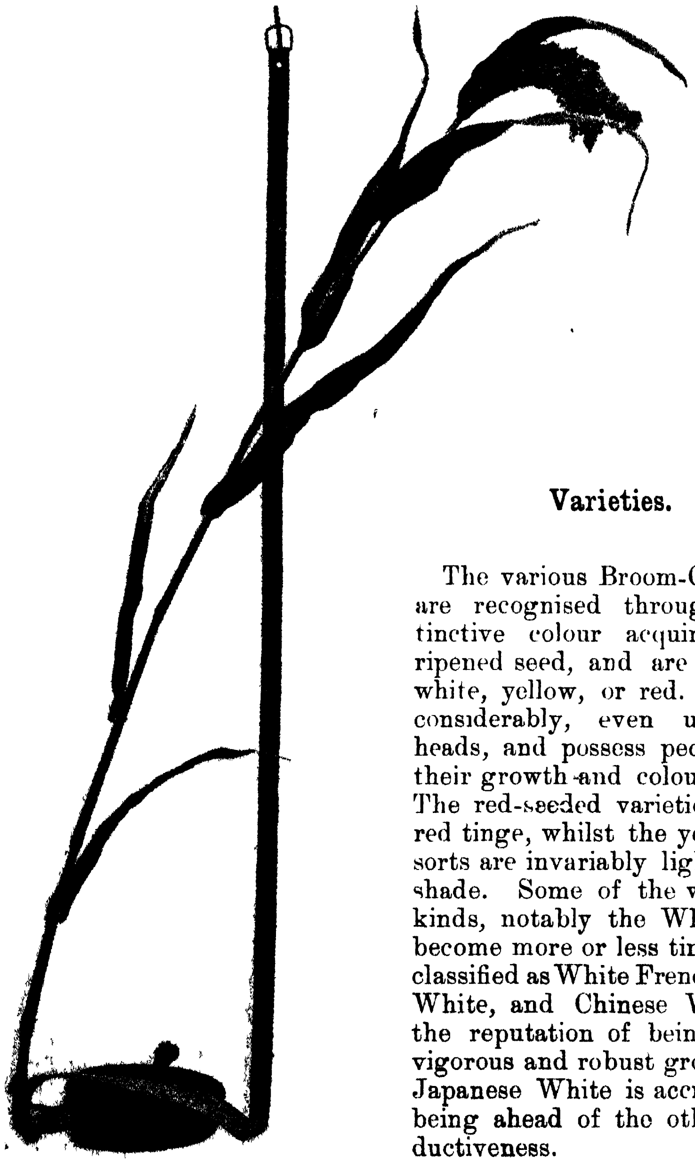
By a series of cuts it was estimated that the crop will average 10 tons of green forage per acre, and provide about 3 tons of coarse hay. It was cut with reaper and binder, and whilst it was realised that such a crop would test the stability of the machine, yet in the absence of special machinery it was our only means of rapidly harvesting it at the most nutritious stage.

There are a large number of Millets. They comprise a number of cereal and forage grasses, ranging from sorghums to the grass Millets, which have been grown extensively for centuries. The nomenclature is confusing, but we know that the French, Hungarian, Pearl, and Broom-Corn Millets, as well as the Sorghums, have given us ample proof of their high value and usefulness, particularly during such seasons as we are unfortunately experiencing at present.

A reference to the back numbers of the *Agricultural Gazette* will show that the Department, and its officers on the various experimental farms, have, season after season, tested these crops with excellent results. These tests have given us all the requisite topical data in relation to their cultivation.

It has been found of service to grow Millets as a catch crop. The seed will germinate and thrive well on land recently cropped with wheat, rye, oats, or barley, or where a crop has failed, or between two

crops. Millets are a good crop after clover, soy bean, or other legumes. It is further known that they succeed best on bare fallow. The cost of cultivation is low, as little is needed once the crop is in. It is found good practice to feed off the first crop with sheep, and allow the second to grow for hay. In any case, when fed or cut, the crop (*i.e.*, the stubble) should be harrowed, to loosen the soil and conserve the moisture. By this means a good second growth can be obtained. In many instances this is found to be heavier than the first.



A Stalk of White French Millet, grown at H A. College Farm.

Varieties.

The various Broom-Corn Millets are recognised through the distinctive colour acquired by the ripened seed, and are grouped as white, yellow, or red. They vary considerably, even under those heads, and possess peculiarities in their growth and colour of foliage. The red-seeded varieties exhibit a red tinge, whilst the yellow-seeded sorts are invariably light green in shade. Some of the white-seeded kinds, notably the White French, become more or less tinged. Those classified as White French, Japanese White, and Chinese White, have the reputation of being the most vigorous and robust growers. The Japanese White is accredited with being ahead of the others in productiveness.

The large class, known as the yellow-seeded, are used as forage crops. Amongst the most favoured are the Turkish, Manitoba Broom, or Hog Millets.

Soil.

The Millets are very hardy. They require a medium quantity of moisture, will grow luxuriantly on a variety of soils, and endure drought remarkably well. They will do best in a mellow soil, rich in humus. Loams, with a medium admixture of clay and sand, answer well. It has to be remembered that this plant secures its nourishment chiefly from the surface soil, and it is good farm practice to stimulate that with readily assimilable fertilizers, or rotted farm-yard manure, keeping in view the need for the supply of nitrogen, phosphoric acid and potash in their most soluble forms. The fertilizers are best harrowed in, and the farm-yard manure applied before ploughing. In our genial climate, however, it is found that Millets will thrive on a large variety of soils, and at the College Farm the land is a poor sandy loam.

Owing to its sturdy habits Millet has always been found a splendid crop to grow on foul land to get rid of the weeds.

When used as a catch crop, late in the season, it is surprising what hardships the crop will endure, and the wealth of the yield.

It will give good returns on higher and drier soils than most grasses.

Sowing.

Considerable disagreement exists as to the quantity of seed to be used per acre. This must be estimated in keeping with the character of the soil and other local conditions, as well as the purity of the seed. We find 7 lb. to the acre sufficient, sown broadcast, but there are instances where it has been found necessary to sow 12 lb. to 15 lb. to the acre.

Where the land is rich and well cultivated considerably less seed will suffice. Thin seeding often results in the growth of coarse-stalked plants, and renders the crop unsuitable for hay.

In sowing, it has always to be remembered that Millets are very susceptible to low temperatures and frosts. Where there is an absence of food—such as exists this season—it is the best plan to sow continuously every two or three weeks as long as there is warmth and moisture sufficient to germinate and raise the crop and to avoid the early frosts.

Late Sowing.

It can be used for forage, hay, or ensilage with equally good results. It may be sown to the end of January, and even later. Some advocate drilling the seed as against the usual method used of broadcasting. It is claimed that less seed need be used, and, further, that if the soil cakes it can be cultivated between the rows to conserve moisture. If for grain production or ensilage then drilling would be advantageous. More seed is required on exhausted soil in comparison with new or rich soils. In all instances sowing should be carried out after rains, or when the soil is moist, to give the crop a start.

Harvesting.

The farmer has to exercise keen judgment to decide the time at which the crop is fit to cut for forage, and at the period when it is at the maximum stage of richness in nutrients as well as palatable and digestible. When cut too green Millet excites laxative action of the bowels. Further, it has to be cut before the seed in the panicles commences to ripen. Strict attention must be paid to this. When the majority of the seed heads or panicles have formed in the green pendulant stage, then have the whole crop promptly cut. It is better to err on the side of greenness. If too ripe there is a possibility of the food becoming unpalatable. The crop green is heavily charged with moisture in both stalks and foliage, and in consequence will take longer to cure than ordinary oaten hay. It should be placed in cocks and allowed sufficient time to thoroughly dry. If the crop be intended for ensilage then it may stand a little longer after heading out, but it must be cut prior to ripening. Unlike other crops, no liberties can be taken at the time of cutting. When converting Millet into ensilage, it is advisable to add a quantity of clover, lucerne, soy bean, or other legume, to provide the balance in nitrogenous food.

Food.

It is one of the most nutritious and attractive of the green fodders that can be used for stock, in so far that it is available at a time when the spring grasses have failed, and green fodders are scarce. It is essentially a summer fodder.

In point of digestibility, the Millets are similar, owing to their composition being approximately alike. From a variety of analyses we conclude that this class of fodder, either in green food, hay, or ensilage, is very useful for dairy cattle, sheep, and young stock. As pasturage it has been found to be excellent food for sheep and calves. The ripened seeds are being largely used for pigs and fowls.

Effect upon Horses.

Considerable mistrust as to the wisdom of feeding with Millet was aroused by the outbreak of an ailment amongst horses, and known as Millet sickness, in North Dakota. This was found to arise where the animals were fed exclusively on Millet hay, but insufficient grounds were forthcoming to condemn it as a food. The adoption of a rational system of feeding, in which Millet hay formed any portion of a ration soon dispelled the cause of complaint.

On horses, when the fodder was cut too green, it acted as a laxative, and when too ripe it over stimulated the kidneys like a strong diuretic.

It is, however, claimed by prominent stock raisers and veterinarians, that a judicious diet, in which Millet hay forms a chief ingredient, restores healthy functions, and stimulates the vigorous maintenance of vital energy.

Mules at the Hawkesbury College Farm.

H. W. POTTS.

In no small degree may we estimate the mule as a desirable accompaniment to the aids we already utilise in farm work.

The resemblance of the offspring to the sire in the case of mule-breeding is distinct and constant. The hybrid progeny displays the characteristic large and clumsy head, long, erect ears, short mane, thin tail, mule ray or stripe extending along the medium line from withers to tail, slender legs, straight shoulders, and narrow, contracted, high hoofs of the jackass. With dull uniformity his influence further predominates in the transmission of external shape, as well as disposition and constitution.

The speed of the horse, with the unerring tenacity and dogged perseverance of the ass, appears to blend and form a conspicuous outcome of this union of species.

Many are the virtues, special and otherwise, claimed for mules for time immemorial, particularly in the older lands of Spain, France, Spanish America, the United States, and, more recently, in South Africa. Centuries of experience have accumulated evidence to justify claims of excellence. The natural formation of hoof and shoulder render the animals especially serviceable in mountainous and broken country, where they can carry a heavy load at a steady pace up steep, rough tracks.

In countries with bad or indifferent roads, coarse, sparse, and scanty herbage and uncertain water supply, mules endure with stoical indifference privations which no horse could withstand. Sagacious, docile, and even affectionate to those who humour and study his temperament, the mule proves to be a valuable worker, and is deserving of more than ordinary attention in lands of varied climates, vast areas, and rough conformation, where, though he will never rival the horse, but serve as a useful adjunct as a beast of burden, and be profitably employed in many phases of farm life.

It is generally recognised that the male mule is stronger, displays greater courage, has more bone, and is less tractable than the female. It is advantageous from a farmer's standpoint that he be a gelding; he is in consequence less liable to become violent and vicious at certain periods during the year.

In selecting the Jackass for stud purposes it is as well, in view of his prepotency, to ascertain his disposition, docility, willingness and facility for working, with lightness and smart gait.

It may prove interesting to briefly summarise the experience acquired with mules at the College Farm during the past three years. Six were purchased in Queensland—one gelding and five mares. In height two may be classed as ponies, 13 hands, two are 14·2 hands, and two 16 hands. They were only broken in to lead with a halter, and had never been in harness, so that, practically, they commenced their apprenticeship on the farm. It was soon made evident that special treatment

MULES AT H A COLLEGE FARM

1. In the seed drill 2 In plough 3 Using the hopper dozer for destroying caterpillars and other pests in potato crops 5 In disc cultivator
The other illustrations are of horses Fig 6 shows a handy skid for transporting implements to distant paddocks

would have to be adopted to avoid arousing the latent and inherent mulish disposition. With a respectful regard to this feature, no difficulties arose in the process of breaking them into harness and rendering them of practical service in the diversified operations of the farm, with one exception, viz., saddle work. A few displayed a superlative objection to being ridden, much to the intense amusement of our students. It was for some time a favoured ceremony to break in student and mule alike. The most ingenious devices, wiles, and plans were concocted to induce an unsuspecting new arrival to take his first lesson in riding on a mule. The placid and guileless serenity of the animal often lent an air of security to the venture. The result may be readily imagined. Now the student who has not ridden a mule or killed a pig is not considered of much account. Apart from this, however, it should be understood that a horse as a saddle hack is worth a

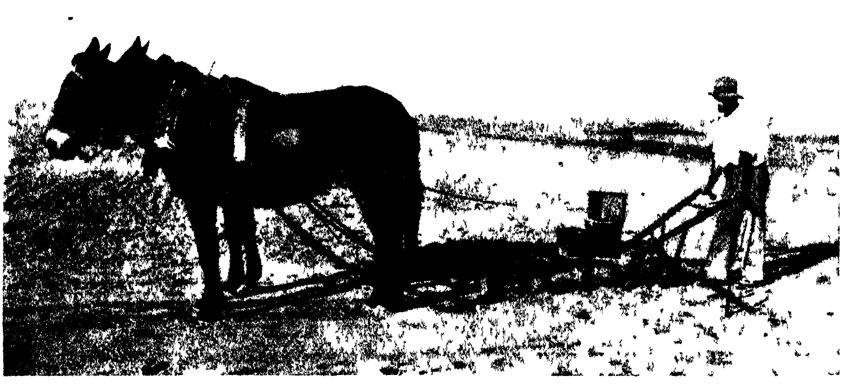
paddock full of mules. After settling down to their new location, and more novel handling by students, it was soon discovered that the mules would not stand housing summer or winter, in fact when stabled they fretted to such an extent as to cause them to lose condition. They are very hardy and able to resist any extremes of temperature. In comparison with their weight, it may seem a bold thing to suggest or assert that they are stronger than horses.

In the matter of feed they will perform a full day's work in any of the ordinary implements on the farm on half the ration of a horse, but they must be fed separately from horses; the latter rob them, and the mules give in to it and retire. They are anything but dainty in the selection of their food, and will keep up a good working condition on a scanty and coarse ration. So far, not any of them have exhibited signs of ailment or disorder of any kind.

They are tractable and easily caught; but a general feeling always seems present amongt those whose duty it is to handle the animals

that it is as well to keep clear of their hind quarters. This is hardly fair to the mules, as I cannot find any records of anyone being kicked. They seem to wear an uncanny look, which suggests caution. They are inclined to be apprehensive, and are readily alarmed. With the exception of working in shafts, they have been trained to work in every machine and implement on the farm, and in each instance they have given satisfactory results and earned good reputations as farm workers. If there be any place more than another likely to test the temper of a horse, mule, or cow by amateur treatment it is in a teaching establishment such as ours. The mules stand the ordeal with wonderful complacency and good nature. "Stubborn as a mule" is a quotation inapropos to this farm.

The ordinary harness of the stable is used, although our farm foreman, M. Cobb, admits that collars specially made to fit the somewhat upright shoulder should be used. There is a general absence of obliqueness in the shoulders. The mules have excellent wind. They move evenly, straight, and smartly in such work as drilling, cultivating, ploughing, and scuffling. Their small upright hoofs and steady gait are apparent, and they rarely injure young plants with their hoofs. The small mules, with the cultivators or ploughs, are admirably adapted for the orchard. They can work close to the trees, and turn with ease and precision at the end of each row. All the



mules respond intelligently and promptly to the driver's voice. During the hot weather their hardiness and condition stand out in prominent contrast with those of the horses. The other morning, with a hot sun and moist atmosphere, 96 degrees F. in the shade, I noticed two of our Suffolk Punch horses showing signs of the heat in the plough at 8·30 a.m., whereas a pair of mules on similar work, and with equal conditions, did not turn a hair until 11 a.m. They do not require shoeing for farm work.

They do not shy or jib, but, curiously enough, they exhibit a marked dislike to associate with horses. When alone they seem contented, and bray to each other with evident friendly intent and kindly

recognition. They commence work at 3 years old, and will steadily pursue a useful course up to 10 years beyond the usual term for a working horse. They have often been found working hard up to 30 years of age.

It is often assumed, owing, possibly, to their assinine appearance, that they are slow. Such is not our experience. It is a pleasure to see the pony mules in scufflers moving smartly along with perfect regularity of tread, and at a pace equal to any horse. In point of fact it has often been proved that with lighter implements they can accomplish more work. There is a record here of three mules harrowing sixteen acres in one day with a lever harrow. We have never known them to "knock up."

They require to be treated intelligently. Each animal's little peculiarities have to be studied, and some consideration made. They will work well all day if taken along quietly and encouraged with the voice. Should the driver get excited, loose his head, or endeavour to push them they exhibit signs of annoyance by their ears, and keep looking back, and eventually become really stubborn. It is then often a matter of taking them out of harness.

There is only one incident mentioned at the College of a bolt, and that arose through the innocence or carelessness of a student.

Mules are of an inquiring turn of mind, and should any unusual noise attract their attract their attention they must turn their heads to investigate.

Many of our students prefer the mule to the horse for drilling, scuffling, and cultivating. They go equally well in single or double harness, in the drag, or farm waggon.

It is observed by all who use them how knowing they are. On the approach of feed-time they will give signals of this five minutes before the stable bell rings daily.

In the use of drill, corn dropper, scuffler, cultivator, harrow and plough, when cultivating for potatoes, maize, sorghums, pumpkins, mangels, turnips, &c., they may be used with profit at all times.

The use of mules may be recognised as a coming factor in farming as well as other operations throughout the Commonwealth. Apart from this, we find in the report of the Horse and Mule Breeding Commission of India the statement:—"A few Australian mules were also inspected; nine of them were very good ones. Mule breeding in Australia is, it is understood, only just commencing, but the animals inspected were such promising ordnance mules, that the Australian market should in the future, if the industry is developed, be able to supply some of the annual Indian requirements until India can supply herself."

Sufficient has been stated to show there is ample opportunity for the introduction of mule raising in Australia on a large scale.

HAWKESBURY DISTRICT FARM NOTES—DECEMBER.

H. W. POTTS.

HAYMAKING is the order of the day, and, fortunately for the farmer, the 5 inches of rain which fell during September and October has caused the cut to be not so light as was anticipated. Summer has set in abruptly with excessive heat and thunderstorms. The past three weeks may justly be classified as January weather. In consequence the crops, both hay and grain, have matured rapidly and brought hay and grain harvest suddenly upon us, and all the conditions of quickly-ripened crops have to be encountered. As was fully forecasted, there is neither the quality nor weight in the hay crops as in ordinary seasons.

Maize.

The continuous high temperature, combined with moisture, has intensified the necessity for constant cultivation to keep under control the rapid growth of weeds and to retain soil moisture. So far, the early maize crops are looking remarkably well.

Crops for Winter Fodder.

Keeping in view the shortage of hay and grain crops for next winter's stock feeding, the main crops to consider now are maize, sorghums, millets, and cow-peas.

Quickly-maturing varieties of maize ought to be put in during this month. Where provision is made for storing ensilage it is seasonable to plant the late or main varieties of maize, and to remember that shallow cultivation must be frequent.

Sorghum.

Owing to the natural conditions of our summer providing all it requires sorghum is above all a summer plant. Its roots strike downward for moisture, and the growth above ground is rapid, succulent, and green. As a forage plant sorghum may be considered more valuable even than maize, although the latter may justly lay claim to supremacy as a food-producing plant. We have never given sorghum a really fair test as a green fodder for cattle and sheep as well as pigs. This season seems especially suited for testing its worth as a fodder for sheep. For this purpose it has been grown successfully in China, South Africa, and recently in the United States. It may be grown over such a vast area throughout our Commonwealth, and now we are looking for food from untried sources during the prevalence of abnormal seasons, it seems that sorghum provides a crop pre-eminently worthy of trial. The rapid and luxuriant growth of the plant responds further to cultivation during the hot weather, and provides an enormous weight of green food. The inevitable period of scarcity has to be bridged over annually, and at a time when the soil is in that warm

condition in which the sorghums revel, more especially when the soil is moist. For early greenstuff, or ensilage, as well as hay, Early Amber, Black Sorghum, Planter's Friend, and Imphee are the sorts best fitted for our district, and further, may be planted late, so as to bring us close into winter. They are hardy varieties, and resist early frosts very well. Last season we had sorghums standing until the middle of May. The advice given last month to cure sorghum as hay for winter feed for the horses should not be lost sight of.

Potatoes.

Some varieties will be found fit to harvest this month, and, in point of fact, are already being dug. Quick harvesting is a point to be promptly acted on to secure the best returns. Wherever the later crops need it cultivation should be continued until the full growth of tops cover the ground.

Sweet Potato.

This excellent tuber can be planted out throughout the month. It is hardy, and will yield well, even with little moisture.

Cow-pea and Soy Bean.

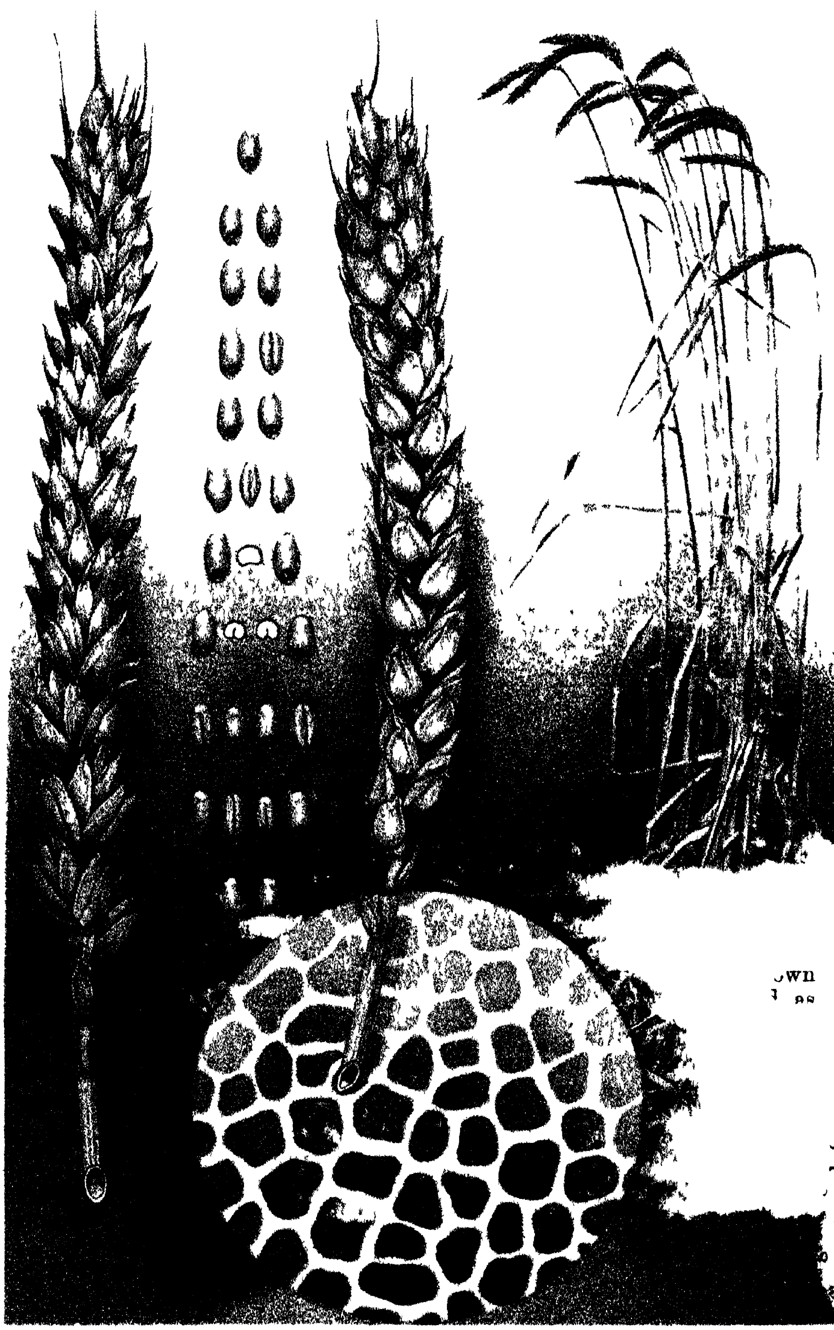
These serviceable crops should not be overlooked this month, The experience of the last dry season is fresh in our minds, and cow-peas then provided an excellent green fodder and hay, apart from the other important quality it possesses of acting as a fertiliser. Further, the weight gained per acre on a poor, dry soil gave ample evidence of the need to cultivate it largely.

Pumpkins.

The crops are looking very well, and it is advisable to continue sowing for late crops to provide for dairy-shed and pig-sty during the early winter months. No crop will provide more profitable returns this season. The weeds should be kept down until the heavy foliage has covered the ground. The plants, moreover, are kept growing in a more sturdy condition if the soil be well stirred.

Root Crops.

Sowings of mangolds and turnips may be made this month where the land has been turned up and exposed to atmospheric influences for some time. Land may also be prepared for potatoes, rape, kale, cabbage, mustard, and a number of other odd crops, which will all come in handy for late summer and autumn feed for cattle, sheep, and pigs. The more fodder one has for such periods, the longer breaking into the midwinter stores can be postponed.



RATTLING TOM.

Rattling Tom Wheat.

N. A. COBB.

THIS is a tall, beardless, free-stooling wheat, with a strong, stiff, slightly-tapering straw of medium thickness. When the wheat is ripening the straw becomes first purplish, then yellowish or slightly brownish. The ripe straw has a dull lustre, and though rather hollow is quite tough, and in consequence it stands up well at harvest-time. The foliage is abundant, long, drooping, the flags being long, broad, of a light or medium green colour, and not glaucous. The smooth, rosy, straight, regular, erect ears are bald, long, compact, and less liable to be clubbed at the tip than are some of the other Purple Straw wheats. The spikelets at either end of the ears vary from their associates, those at the tip being slightly awned, while those at the base are small and sterile; but this latter feature is less prominent than in many other varieties. The spikelets spread widely, and contain from three to four grains, and in consequence the bulk sample presents a medium proportion of small grains. In colour the chaff is of rather uniform and dull rosiness, being rather acute and smooth—that is, not velvety—deep, roundbacked, and firmly attached. This firm attachment of the chaff causes the variety to hold its grain rather tenaciously, so that at harvest-time there is little liability to shelling, and almost any kind of harvesting machinery may be used without much loss from this source. On the other hand, this variety is less satisfactory to thresh on this very account, though there is no serious difficulty if care is exercised.

The large, rather hard grain is of medium size and contour; of medium length, straight and symmetrical, rather flat, opaque, of a medium yellowish tint, flat-bosomed, blunt at both ends, and has a rather coarse abundant brush, a deep crease, and a mealy inside. The germ sculpture is one-third as long as the grain; a back-crease is rarely visible.

Rattling Tom is a Purple Straw wheat, and has the merits and defects of that group of varieties. It is prolific under good conditions in those parts of the State where Purple Straws are largely grown, and its grain has a good market value in this country and in England. As to the absolute food and [illegible] value, not much is known from the result of scientific tests; but [illegible] safe to say that they are not essentially different from those of the [illegible]

[illegible] variety to do well in a number of parts of the State [illegible] conditions of soil and clim[illegible] [illegible] this leads me to [illegible] under all those circumstances that favour the growth [illegible] in the principal wheat growing districts. It is very [illegible] in a rusty season will [illegible] this disease. [illegible] susceptible to most untoward conditions, such as bad drainage, [illegible] competition. I think, from having watched it for several [illegible] fairly resistant to dry weather. It should be sown early, as [illegible] midseason wheat, or perhaps early midseason.

[illegible] —Tall, strong, purple straw; large, straight, [illegible]; large, yellow grain, of good market quality: midseason, [illegible] not liable to shell.

[illegible] —Steer's and Hudson's Early Purple Straw, Farmer's [illegible], Red Straw, Northern C[illegible]ion, Jacinth, and to a less extent Rattling Jack and Cross's Prolific.

NOTE.—This completes the first quartet of descriptions of Australian wheats, accompanied by coloured plates:—Rattling Jack, Blount's Lambrigg, Allora Spring, and the present variety. The selection of these four was the outcome of artistic and lithographic considerations, rather than of consideration of the importance of the variety.

Farm Notes.

BATHURST FARM NOTES—December.

R. W. PEACOCK.

Owing to the drought, many of the wheat and oat crops throughout the district have failed, and will not be worth harvesting. The considerable shortage caused thereby must be faced, and every effort made to grow fodder for the stock by means of the various catch-crops. The land should be ploughed as soon as possible to make the most of any showers which might fall. Those farmers possessed of fallowed fields are in an excellent position to make the most of the situation.

Maize, Sorghums, and Millets.

These crops should be sown in drills in well-prepared soils, and frequently cultivated throughout their growth.

Rape.

This important fodder plant can be sown towards the end of the month; it withstands a considerable amount of dry weather, and is excellent for sheep and pigs.

Swedes

Should be sown in drills throughout the month. They make good stock food, and can be stored for winter use.

Potatoes

Can be planted during the month for the main crop.

The early-planted summer crops should be cultivated thoroughly whenever a shower has caused the surface to crust, as a loose, dry soil mulch is very effective in conserving moisture. Land should be prepared for such cereals as barleys and ryes, which should be sown during January and February, for winter fodder. As much land as possible should be ploughed for next season's crops, as land thus treated is more easily ploughed than when left till later, and is always in better condition for the reception of the grain at seed time. Such land is more receptive of any light showers or storms, which may fall throughout the summer, especially upon the hill sides, helping to ensure the germination of the seed at the best possible time, which often proves one of the principal factors of success. Weeds also are kept down, and plant food is made available from the mineral constituents of the soil. It is lamentable to see the failure of many of the crops at the present time, due in a measure to the superabundance of weeds, indifferent tillage, and late sowings.

RIVERINA DISTRICT.—DECEMBER.

G. M. McKEOWN.

Maize

MAY still be sown for ensilage or green fodder where it can be irrigated.

The best soil for the production of this crop will be found in the black soils of our river-flats.

Deep ploughing is essential, and the soil should be brought into a fine tilth by means of harrowing.

An excellent implement for the purpose will be found in the double-spading harrow.

Seed should for all purposes be sown in drills at 3 to 4 feet apart.

All growing crops should be frequently scarified lightly with the horse-hoe. In these dry districts the plants should not be hilled, as the operation of hilling seriously injures the roots, and makes cultivation of the crop during its growth very difficult.

Sorghum

May still be sown in well-prepared land, preferably river-flats, in situations sheltered from hot winds, where irrigation is practicable only.

Seed should be sown in drills about 3 feet apart, allowing 8 lb. to 10 lb. seed per acre.

The best varieties, so far, have proved to be Amber Cane and Planter's Friend.

All growing crops should bo well tilled with horse-hoe.

Millet

May still be sown, provided fair showers fall during the month.

The Hungarian and Japanese varieties will give the best results. Seed should be sown at 12 to 15 lb. per acre, in finely-prepared land, and lightly covered with a light lever harrow.

The crop should be cut for hay before the seed forms.

Pumpkins and Melons.

The soil round the roots should be well mulched, and, where possible, supplied with water.

Where cultivated on a larger scale, keep the harrow or horse-hoe going between the rows as long as the size of the vines will admit.

Pinch off the ends of vines to promote a greater lateral growth, thus ensuring greater bearing capacity, and at the same time shading the roots of the vines from the prevailing heat.

Air-slaked lime or wood ashes dusted on the vines will prove an effectual remedy for beetles, &c.

Tomatoes.

Mulch and water as liberally as possible. All plants should be tied to stakes. The single-stem system, provided the upward growth is kept in check, and a liberal lateral growth is promoted, gives good results; but the most satisfactory method will be found in the use of three stakes to each plant. The stakes should be sloped well outward from the plants, of which three main branches should be trained, one on each stake. By this system ample protection from the sun is afforded the main stem and roots, and crowding of the fruit among the foliage is prevented. The liability to fungus diseases is also decreased should the season prove moist.

Strawberry Pests.

If it were not for pests strawberries would be about the most profitable crop that anyone fond of intensive cultivation could take up. Of recent years there have come into cultivation several varieties that thrive to perfection in respective districts of New South Wales, and no matter how the output of berries increases the market demand seems to keep just a little ahead. But the lot of the strawberry-grower is not easy. There are innumerable pests that prey upon every portion of the plant—roots, foliage, and fruit—and they work in shifts throughout the whole twenty-four hours of the day and night. Among some of the most destructive are cockchafer grubs, which gnaw off the roots; the grubs of several borers which attack roots, the crown of the plant, and the stalks or runners; caterpillars that devour the leaves, and others that bind the leaves together with webbing, and probably, worst of all—since they also attack the fruit—an assortment of cutworms that spend the day an inch or two under the soil, and come out at night to despoil the crop and plantation. It is extremely difficult to deal with these creatures in the ordinary way of an arsenical poison spray, because of the fruit in all stages of ripeness. The only safe means of destroying them is to make up poisoned baits and leave them around in places where the cutworms will be most likely to find them. As a medium for the poison, little slices of raw sugar beet or carrot are very good, as they can be readily stuck in the ground about the strawberry plants, and the grubs have a marked liking for such vegetables. The underground feeders are more difficult to destroy, and when the bed becomes thoroughly infested the only course is to transplant to another patch, so that the old bed may be thoroughly rooted over with the object of starving and destroying the intruders. When transplanting extreme care must be taken not to leave in the roots any of the old soil which may contain the eggs or larvæ of the pests. The whole plant should be submerged in water, and every particle of it carefully sluiced. As a rule strawberry beds are enclosed in such a way as to be fowl-proof. Thus it would be easy to keep in the bed a seagull or curlew, which would eat up many of the adult insects which visit the strawberry bed to feed or deposit eggs.

Orchard Notes.

W. J. ALLEN.

December.

The beneficial rains which fell during October and November have gladdened the hearts of most of our fruitgrowers, and the prospects for a good fruit harvest have been practically assured. While some varieties of apricots, more especially in districts away from the coast, are carrying exceedingly light crops, those in many of the later districts are showing good average crops, in fact, some of the trees are so heavily laden that unless thinning is resorted to the chances are that there will be small undersized fruit this year notwithstanding the very favourable growing weather which we are experiencing. At time of writing, all the other stone fruits are showing for good crops in spite of the severe drought of the past year.

Those who have applied manures will derive the full benefit from such applications. Weeds are making such luxuriant growth, thanks to the late rains, that it will be necessary to keep the soil well stirred so as to keep them under, and also to prevent them robbing the trees of the nourishment which they require for the proper maturing of their fruit. In districts where irrigation is practised it will be found necessary to give all fruits a good watering this month. As soon as the ground is dry enough after such watering put the scarifier to work and get the ground up to a fine state of tilth. This work should be done before the ground becomes hard and cracked, the best time to commence being just as soon as the horses and cultivator can work without the soil sticking to the implements and the horses' feet.

Keep a strict outlook for pests, and if trees have not been sprayed or fumigated, as the case requires, the grower should lose no time before beginning to fight them.

For scales on citrus-trees December, January, and February are good months for either spraying or fumigating; but for fungus diseases it is generally best to spray once before the trees bloom, again as soon as the fruit has set, rather than leaving it until now. In many cases, however, later sprayings are both beneficial and necessary.

The grower should not neglect to either fumigate or spray all citrus-trees so as to ensure clean fruit and healthy trees.

Keep a strict watch over all bandages placed on apple, pear, and quince trees. They should be overhauled and all larvæ destroyed at least once every ten days; also pick up and destroy all fallen fruit.

If fruit fly should make its appearance all infested fruit should be destroyed, so as to assist as far as possible in keeping this pest in check.

All fruit intended for drying should be allowed to hang until thoroughly ripe, when it may be picked, cut in halves, placed on the drying trays, fumigated as soon after as possible, and then either put out into the sun or into the evaporator to dry.

The Union Box Company of Sydney forwarded me a sample drying tray last season, for which they were charging 8d. made up. This includes narrow strips on the sides to keep the fruit from rolling off. The tray was all that could be desired, and any person requiring drying trays would do well to communicate with this firm.

It may not be amiss for me to mention here that the Blue Oil Emulsion diluted in the proportion of 1 gallon of oil to 40 or 50 gallons of water is as cheap and effective a remedy for black aphis as any of the many sprays which we are continually trying at our experimental orchards.

The blue oil should be emulsified by thorough mixing in 3 or 4 gallons of boiling water and soap in the ordinary way, and then, when there are absolutely no particles of free oil to be observed floating on the surface of the creamy compound, the water for diluting can be added. Blue oil, or crude kerosene, in direct contact with peach-trees will do injury to the foliage, and perhaps kill the tree. As an emulsion properly prepared no harm will result.

In tropical districts pineapples may be planted if moist weather prevails. Suckers are the best to plant, being much the stronger and the earliest to arrive at maturity. Being a great feeder, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young cultivation must be thorough, but not deep enough to cut the feeding roots which are near the surface. Bananas and other tropical fruits may also be planted during the rainy season.

Sheep in the Orchard.

At this time of the year (beginning of December) it is not an easy matter to decide how to make best use of the thistles and other tall, harsh weeds that have taken possession of the orchard where for any reason or other scarifying has been neglected. If one uses a scarifying implement that will tear out the weeds and rake them off the land, the growth thus removed is all dead loss. If an implement is used which simply cuts off the weeds an inch or two below the surface, and leaves them practically where they fall, the litter soon dries up and blows away, or, if it remains, merely serves to clog the cultivator for the rest of the season. Turning tall, tough weeds under at this time of the year may prove disastrous to the crop, because if the weather should prove to be dry—as it most probably will in mid-summer—the soil which is kept open by straggling masses of weeds will get parched in no time.

The writer has often wondered if there is any practicable manner of turning these weed-growths to profitable account. In some orchards just now the weeds are most luxuriant. Of course, they have no business to be there at all; but they are. Now, there are districts in which the meat question is a most serious one, and in which there are in groups orchardists and farmers who could consume a sheep or several sheep a week. Supposing one of them were to try the experiment of obtaining ten or twenty store sheep, to be topped off on the nutritious weed-growths that over-run orchards. Apart from the convenience one's family would enjoy from the production on the premises of good mutton, there would be the advantage of getting rid of summer grass, sorrel, and weeds by an automatic process which would return something in the shape of money, mutton and manure, instead of costing time, trouble, and labour. It is very probable that under such a system many of the growths that now defy the scarifier would soon be things of the past, and there would no longer be necessity for the sheep. Surely that would be ample compensation for any extra trouble the presence of sheep on a holding not originally intended for them might cause. In some of the big apple-growing countries—notably in Canada and also in Tasmania—where apple orchards are easily irrigated, and excess of moisture in the fruiting season, rather than lack of it, has to be contended against, many orchards are kept under grass for several years at a stretch, and sheep depastured. One prominent American apple orchardist, in writing of the advantages to be derived from keeping a small flock of sheep as an adjunct to apple-growing, says: Sheep, if properly fed, will keep down the weeds and grass, eat the fallen apples, and add very materially to the fertility of the soil. Orchards are continually over-run with insects, which are multiplying on every hand, and are becoming more destructive than ever. The spray-pump will subdue many; but there are some, such as the grub which bores through the fruit, which the sprayer cannot reach, and to destroy them in the fruit as it falls is the only effectual way of getting rid of such pests. In this work the apple-grower has no better assistant than sheep. To get the best results from running sheep in an orchard there must be enough of them to keep the weeds or grass eaten down. In some grassed orchards the practice is to put in twice as many sheep as there is pasture for, and to provide a liberal ration of grain or bran. Under such an arrangement, running ten sheep to the acre, it takes, with grain and bran at normal rates, about 12s. 6d. a week to feed 100 sheep (a couple of bags of bran, or 250 lb. bran, and a bushel or so of grain), which will be at the rate of about ½ lb. of bran and grain a day per sheep.

Three special objects are thus attained: The sheep are good insecticides, and will destroy the codlin moth grubs and fly-maggots in all the fruits that fall. They eat the weeds, and enrich the soil with their droppings. Several instances are given of orchards that are entirely dependent upon sheep for manuring and restraint of certain pests and noxious vegetation; but the conditions under which fruit is grown in New South Wales will, perhaps, only permit of a very moderate and intermittent use of sheep. That a small flock of sheep can be of

immense use to the orchardist is beyond doubt; but it must not be taken for granted that any or every kind of sheep turned loose in the orchard would be content with grazing on weeds, summer grass, &c. There are plenty of sheep nowadays that have long since forgotten how to graze, and such sheep would take to gnawing the bark and lopping the limbs of fruit-trees from sheer force of habit. The sheep best adapted for orchard use are Shropshires or Southdowns, which have been reared on small farms. Pure bred sheep of either of these breeds are naturally quiet feeders, and so long as a box of chaff or a few handfuls of straw are at hand to satisfy their desire for a bite of dry feed to help digest the green stuff, they will graze contentedly and make no attempt to interfere with the fruit-trees. If an odd one did prove to be mischievous, the harm he could do amongst well-grown trees trained high enough for horse-work in the orchard would not be much, and there is the butcher's block to put an end to his tricks. Smearing the stems and trailing limbs with some distasteful preparation would also deter them from touching the trees during the few weeks at most the sheep would be quartered in the orchard. Blood used as for rabbits and hares would not be a success unless plenty of rock-salt were provided for the sheep. In the absence of salt they would lick the saline dried blood on the tree trunks, and perhaps acquire the habit of gnawing. In most cases where natural grazers like farm-bred sheep take to gnawing and browsing, it will be found that there is something defective (generally salt) in their food.

A few ordinary sheep might easily enough be kept on tethers arranged in the following way. Take a piece of fencing-wire about 40 yards long, make at each end of it a permanent loop that can be slipped over strong stakes or crowbars securely driven at a distance sufficient to strain the wire, at about an inch from the ground, straight down the middle of the space between rows of trees. Put a collar on the sheep, and with 6 or 8 feet of line make him fast to a ring on the wire. As he feeds, the ring will slip along the wire and the animal will thus be able to eat clean a strip 16 or 18 feet wide between the trees without being able to nibble the branches or stems. Greater lengths of wire might be used, but, unless they were stayed at intervals with stout pegs, there would be risk of a strong sheep being able to pull over in the slack far enough to get at the trees. Where orchards are subject to evening visitations by gentlemen with a cornsack, the same apparatus with a bull dog on the sheep ring might be profitably utilised in the conservation of the crop.

As to what sheep cannot eat and grow fat on it is difficult to say. In America some years ago investigations were carried out in several of the north-western States with some 600 varieties of weeds and grasses growing there, and it was found that while cattle would eat 56 of them, and horses but 82, sheep consumed no less than 576 of the varieties, and did well on them.

Practical Vegetable and Flower Growing.

W. S. CAMPBELL.

Directions for the Month of December.

Vegetables.

During the month of December sometimes the weather varies a good deal, from dry heat to wet, muggy weather. If the season is dry, vegetable-growing during this month is a difficult matter; but if wet, or moderately so, many varieties of vegetables are likely to thrive excellently. Where facilities for irrigation are available, there need be no want of vegetables at any time of the year.

Insect pests are very often prevalent during the hot months of the year amongst some of the vegetables, chiefly aphis and caterpillars on cabbages and other members of the cabbage family, and not infrequently it is most difficult to raise any of these plants when aphis appears in extraordinary numbers. It is said that sulphur, dusted amongst the leaves of the cabbages, will prevent the attacks of both caterpillars and aphis.

Beans, French or Kidney.—Should dry weather prevail and irrigation be impossible from want of water, the beans are not likely to thrive; but in those districts where the rainfall has been good, this vegetable should be yielding plentifully. Old plants, which have fallen off in this production, had better be rooted out, and then the ground can be well manured, and cabbages, leeks, tomatoes, or any other seasonable vegetables, preferably neither bean or pea, can be planted or sown. On any other vacant ground, a further sowing of any kinds of kidney beans, scarlet runners, snake beans, or Lima beans may be sown. The application of a heavy top dressing of farmyard manure between the rows of beans, as well as of other vegetables, should be of considerable advantage to them during the hot summer months.

Broccoli.—This member of the Brassica, or cabbage family, is closely allied to the cauliflower, and probably but few persons could recognise a difference between them. The heads of the broccoli are generally smaller than those of the cauliflower, and have a more yellow tinge; the leaves surrounding the inflorescence too are more numerous, and the broccoli is generally considered to be more hardy than the cauliflower. Sow a small quantity of seed where it can be well attended to, either in box, seed-bed, or seed-pan. On no account allow the soil to become quite dry after the seeds start into growth, or germinate. A shade had better be used. An old bran bag or chaff bag, cut in two and fixed on any rough sort of frame, would answer splendidly as a shelter and sun-break, under which seeds can be raised. Under such a protection, the soil is likely to keep fairly moist. A mulch of finely broken-up dung, spread over the surface of the seed-beds, will be a still further advantage and protection.

Borecole, or Kale.—Sow a few seeds during the month. This is as good a vegetable as anyone could grow for winter in the cold climates, for it will stand very cold weather indeed without injury. It does not seem to be grown nearly so much as it deserves. Nearly everything has to give place to the everlasting cabbage, which, though excellent vegetable as it is, should not be altogether depended upon, when there are so many good vegetables allied to it, and some of which succeed better under various conditions.

Cabbage, Cauliflower.—Follow the advice given above for broccoli. Seedlings of any of the Brassicas should be pricked out into well manured beds, as soon as they are large enough to handle. Here they should grow into good strong plants for the final planting. Plant out any plants that are strong and hardy enough to stand the shift. Water well before shifting, and water well after planting; and if but little injury has been caused to the roots, they are not likely to feel the shift.

Cucumber.—Seed may be sown with the chance of a return. It is rather late, even in the beginning of the month, to raise this vegetable. Good and frequent supplies of liquid manure will improve the growth of cucumber plants already above ground.

Celery.—A sowing of seed once during the month should suffice for requirements. Advanced and suitable plants may be planted out, but it would not be worth while going to this trouble unless a good supply of water be available.

Cress and Mustard.—Most useful for summer salads, but these plants need good supplies of water and occasionally some liquid manure. Sow seed, sufficient to give a supply, say about once a week.

Egg Plant.—Seed may be sown, if any plants are required. Seedlings already raised may be planted out about 3 or 4 feet apart.

Maize-sugar or Sweet.—Seed may be sown in the warmer parts of the State about the coast. Some might be tried in other and cooler localities; but, if the summer is short, it is doubtful whether the cobs will mature sufficiently for use as a vegetable.

Onion.—A trial of a little seed might be made where the season has hitherto been favourable for vegetables. Onions which are already growing should be well looked after and kept free from weeds without heaping or drawing any soil over the bulbs as they form.

Parsley.—A little seed may be sown, if any plants are required.

Peas.—Are not likely to succeed very well in the warm districts, especially should the weather be dry. In cool districts a few rows should be sown, and it is very probable that they will succeed satisfactorily, should there be sufficient rain during the time of growth.

Pumpkin.—Seeds may be sown; but it is somewhat late at this time of year to raise plants.

Radish.—Sow seeds two or three times during the month—a little at a time—in order to keep up a constant supply of a few radishes. Make use of this vegetable whilst it is young and tender, and discard all large overgrown roots.

Spinach.—Sow a little seed of this useful vegetable, which does not seem to be as well known as it should be.

Tomato.—Ripe fruit should be plentiful by this time wherever the season has been satisfactory, and the rain or water supply sufficient. Examine the plants occasionally for unsound or diseased fruit, and destroy such fruit by fire as soon as possible. If any plants are needed, seed may be sown, or young plants already raised may be planted out. Gather all fruit as soon as it ripens, and do not leave any to rot on the ground.

Sweet potatoes.—Any plants on hand, which have been raised from cuttings may be planted out as soon as possible in the beginning of the month.

Turnip.—A little seed may be sown in drills occasionally.

Flowers.

CONSIDERATION should be given to such plants as those which produce flowers during the autumn, which season is very often the most satisfactory during the year in many portions of the State of New South Wales. The most conspicuous flowers are the chrysanthemums and the dahlias. If superior blooms of either of these plants are required, a good deal of trouble is necessary for some time before they flower. Both need good supplies of water, if the rainfall has not been sufficient, and both are improved by the application of liquid manure, which, however, should be discontinued as soon as the flowers are partly open. The necessary liquid manure, which will be found useful also for any other of the garden plants - including pot plants—can be made by soaking cow, horse, or fowl dung, either separate or combined, in water. Say a bucketful in half a hogshead of water. Only the clear liquid should be used, after the dung has been soaked a few days. It can be diluted with water for various kinds of plants, if judged to be too strong. Better apply rather weak to all plants, and the grower be on the safe side. If cosmos plants were growing in the garden last year, it is more than likely that numbers of seedlings are coming up, or even some of those which come up early are in flower. This is a useful flowering plant for the autumn, when it succeeds best. The yellow variety, Klondyke, is well worth growing, as it makes a pretty contrast to the other varieties, and is a very showy plant when in full bloom. Carnations will need attention, should the weather be dry, and should be kept well supplied with water; otherwise, if allowed to want moisture, they may suddenly die off. The carnation has become a great favourite, and many handsome kinds of the perpetual class can be obtained. Bouvardias, if well treated, will keep up a constant supply of flowers well into the winter months. As the flowers drop off, prune the flower-bearing branches, and apply liquid manure, and they will very speedily flower again. The bouvardia is as useful a plant, with the exception of, perhaps, the tea-scented rose, as could be grown in cottage or farm homestead gardens. Plants may be planted out in the early autumn, or else in the spring. If extensive autumn planting of evergreens is to be carried out, preparations should soon be begun. The autumn is the very best time of year to plant evergreens of any kinds, and it is also the best time to propagate cuttings of plants.

General Notes.

Pickling Olives.

The demand for pickled olives is certainly not enormous in New South Wales; still there is, judging by the quantities of the article imported, a fairly good opening for the preserves attractively bottled. In California, where the olive does not grow a bit better than it does here, quite a large industry has grown up in the manufacture of olive oil and in pickling. Mr. F. T. Bioletti, of the California University Agricultural Experiment Station, gives in a special publication on the subject the results of his experiments to determine the best methods of treating ripe fruit and green fruit:—

Pickling Ripe Olives.

"The olives used in this experiment were nearly all dead ripe. They had been picked and shipped without any special precautions, and were considerably bruised. The problems investigated were whether large, over-ripe, bruised olives, which were otherwise in good condition, could be used to produce wholesome marketable pickles, and whether such pickles could be preserved in good order for a reasonable length of time. The olives were sorted and graded, and experiments made with eight varieties. They were covered with a 1·4 per cent. lye solution, and in most cases with a 2 per cent. salt solution at the same time, and left from seven to twenty hours, after which they were rinsed and covered with a 2 per cent. salt brine. The brine was changed from time to time, and gradually increased in strength from twenty-five to thirty-eight days, at the end of which time they were placed in a 12 per cent. salt solution, and either immediately or about eight months later transferred to (1) a fruit-preserving jar and left untreated; (2) an earthen jar and kept submerged by a floating cover; or (3) a fruit-preserving jar and heated to 80° C. once and sometimes three times. In some instances the jars were sealed and heated, and again they were covered with a layer of paraffine before sealing and heating. The details and results of all these different methods are given at length.

"The results of the experiments show that even soft, over-ripe olives may be successfully pickled by proper modifications of the lye and salt method, even when the fruit has been somewhat carelessly handled before picking and when the water used is not of the purest. The main precautions in such cases are to use a certain amount of salt from the beginning of the process, and to watch carefully for the first appearance of scum or slime on top of any of the liquids in which the olives are immersed. On the appearance of the slightest of these signs of fermentation, the solution must be changed and the receptacle thoroughly disinfected with boiling water. The salt hardens the flesh, and makes it more resistant to fermentative organisms which exist in the water, and at the same time the antiseptic properties of

the salt, even when used in such small proportions as 2 per cent., are probably of use in delaying the increase of these organisms, moulds, and bacteria. All the samples, with the exception of the Sevillano, kept without perceptible deterioration for eight months in open jars after pickling, although they were unprotected from the air except for a floating wooden cover. A ring of mould formed around the edge of the cover, but there was no perceptible injury to the flavour of the pickles, except for a slight mouldiness in taste of the Sevillano.

"Eleven unheated samples kept in a fair to good condition for eleven months, but they were all more or less spoiled within thirty-two months. Twenty samples heated to 80° C. kept perfectly for thirty-two months, at the end of which time they were as good as when made, with the exception of one sample which deteriorated slightly.

"It may be concluded from this, that heating to 80° C. (176° F.) is a sufficient means of preserving ripe olives, even in weak brine, for an indefinite period in hermetically-sealed glass jars, provided that they are exposed to no greater changes of temperature than occur in an ordinary room in Berkeley (California). There is every reason to believe that a slightly higher heating, say, 90° to 95° C., would have made them perfectly secure in any climate. . . . The only objection to heating noted was that it causes a diffusion of the colouring matter of the olives into the brine, so that after heating the olives were lighter coloured and the brine darker than before. This diffusion, however, takes place in time even with unheated olives, and at the end of thirty-two months the unheated olives were in most cases actually lighter coloured than those which had been heated.

"The results of the test indicate that Gordal, Manzanillo, Columbella, and Regalis are the best varieties for home use, and that Sevillano, Mission, Picholine, Manzanillo, and Gordal are most satisfactory for market purposes.

"*Pickling Green Olives.*

"Experiments have been made to determine the best methods of pickling green olives so as to preserve the green colour. None of the usual methods of treating ripe olives, either with comparatively strong lye for short periods or with weaker lye for a longer period, was successful; and in pure running water the olives turned brown the quickest. This fact suggested that perhaps the oxygen in the air dissolved in the water might be a factor in the discolouration. Further experiments were therefore made with weak lye solutions, which had been boiled to expel the air. The olives were kept in the lye solution until their bitterness was neutralised. With the weaker solutions it was found necessary to renew the lye several times. After neutralisation they were pickled with salt solutions of gradually increasing strength, as with ripe olives. By this treatment it was found possible to produce green olives which retained their colour for twelve months. It is necessary first to find the proper strength of the lye solution to use for the variety or grade of olives to be pickled. This may be done by using a series of pint fruit-preserving jars

containing the olives. In these should be poured different strength lye solutions, beginning with ½ per cent. and increasing by ½ per cent. to 3 per cent. solutions. When a solution is found just a little stronger than is necessary to neutralise the bitter principle in the olives in forty-eight hours, this strength should be chosen for curing the bulk of the crop. The proper strength having been determined, it is recommended that the olives be placed in a 50-gallon barrel having a 4 or 5 inch bung-hole and covered with lye. After soaking forty-eight hours the lye should be drawn off, the olives washed quickly with two changes of fresh water, and covered immediately with a 2 per cent. brine solution. This should be replaced successively by 4 and 8 per cent. solutions, allowing each solution to remain from forty-eight to seventy-two hours, depending on the size of the olives, and finally by a 12 per cent. solution.

"The essential part of the process is to avoid exposing the olives to the air during the pickling, until all the bitterness and acid are completely neutralised by the lye. After this the green colour seems to be fixed, and exposure to the air does not change it much, though it is well, all through the process, to avoid leaving the olives uncovered by liquor any longer than necessary.

"As different varieties of olives and even the same variety in different seasons and from different localities differ very much in bitterness, the importance of treating each variety separately is evident, as each will require lye solutions of different strength to neutralise them. Very bitter olives, such as Mission, Sevillano, Manzanillo, and True Picholine, require solutions containing from 1½ to 2½ per cent. of pure potash lye, while olives containing little bitterness, such as Ascolano and Columbella, require only from ½ to 1 per cent. solutions. As many of the commercial lyes are far from pure, some containing not more than 50 per cent. of potash, the number of preliminary tests must usually be at least six, as indicated above. Preliminary tests conducted as described do not require an analysis of the lye, though it is probable that lyes containing a large amount of common salt would act more slowly; and with such lyes a treatment exceeding forty-eight hours might be necessary."

Picking, Curing, Packing, and Marketing Lemons.

At the meeting of the Southern California University Farmers' Institute, Mr. C. C. Teague, of Santa Paula, read a paper entitled, "What is necessary to successful Lemon Culture?" Of course, the conditions he took were those of California, where lemons are grown under irrigation; but much that can be said about the culture and handling of lemons in California applies with equal force to New South Wales. According to Mr. Teague's remarks, the lemon in California thrives best, as it does here, in the lighter loamy soils in situations not subject to severity of frosts. In selecting trees for planting out, Mr. Teague urges the necessity for ascertaining where the nurseryman gets his buds from—whether from bearing wood from trees well known to bear the best of fruit, or from suckers, which are so much easier to get, and

are on that account much too freely used. Trees from sucker buds grow well enough, but they are slower in attaining bearing, and do not appear to bear such good fruit as trees from buds taken from bearing wood.

In the selection of varieties, the Californians seem to have just about the same range as we have; that is, the good old Lisbon, the thornless Eureka, and the Villa Franca—as the three main varieties which have each proved suitable in particular localities. It is not much use reproducing Mr. Teague's advice as to cultivation, because the conditions of orchard treatment with and without irrigation are necessarily very different; but it is worth the while of every lemon-grower in New South Wales carefully reading through what follows here on the important questions of picking, curing, packing and marketing lemons. "Many of our lemon-growers," says Mr. Teague, "do not seem to realise how important it is to cut lemons at the proper time; but seem to think that any time when they can get to them is good enough for the lemon, and that after they get their oranges out of the way, and nothing else around the place needs attention, they can begin picking lemons." It is considered in California that a lemon that is allowed to completely ripen on the tree is not of much value, because of the large size and inferior keeping qualities. Mr. Teague recommends picking with a $2\frac{1}{4}$-inch ring, never allowing over six weeks to elapse between pickings, and usually not over a month. Great care should be exercised in the picking and in every detail of handling the lemon from the time it leaves the tree until it is shipped. If a grower cannot realise that careful handling is absolutely essential he had better grub out his trees, because the only way that the lemon business can be made profitable is to treat the fruit as trade demands. Mr. Teague says that at one time he was of the opinion that after lemons had been in the packing-house for a few weeks they could be handled much less carefully than when freshly cut, but experience had taught him that such was a mistake, and that, if anything, the cured lemons are the more easily injured.

"After the lemons are picked the question that confronts the grower is: What am I going to do with them? Many have succeeded up to this point, and have still not found the lemon business profitable. As a rule, the grower who has to depend upon selling his fruit green to the buyer who is willing to pay the highest price for it has not been successful for the simple reason that, when the market was low, the buyer did not want the fruit at any price, and when it was high the grower usually had very little fruit. In other words, few buyers have facilities, and are prepared to hold lemons during periods of low prices, and if the grower is not prepared to handle his own fruit, he meets with loss. Many prominent growers have had such poor success in their attempts to hold their winter lemons that they have abandoned that method, and are advocating marketing the lemons as fast as they are picked from the tree. If we were obliged to sell our lemons as soon as they are picked, and could not hold them through periods of low prices, the lemon business would be doomed to failure. Consider [illegible] moment; nearly 75 per cent. of our lemons are picked during the

winter and spring months, when the price is usually low, and when lemons shipped to Eastern markets will sometimes hardly bring the cost of freight. On the other hand, over 75 per cent. of the market—in other words, the consumption of lemons—is in the summer months. (The case here is identical.) What, then, must the grower do to make his business profitable? He must certainly be prepared to hold his lemons through periods of low prices until the time arrives when he can sell them at a fair profit. Can this be done? It can. The principle in the successful keeping of lemons, though exceedingly simple, is not well understood by many growers. To obtain this result, proper ventilation is much more important than low temperatures. In simple language, the proper condition to maintain is at a point just between where the lemon sweats and where it shrivels. If this condition can be maintained, the lemon will keep almost indefinitely. Many growers who have had good success in handling small quantities of fruit will think this a simple matter; but when they attempt to handle large quantities, and are confronted with the proposition of massing large quantities of green lemons in the same house with lemons in different stages of curing, they will conclude that they do not know as much about it as they think they do.

"How can the point between where the lemon will sweat and where it will shrivel be maintained? Certainly not with the double-walled, closed curing-houses almost universally used by our lemon-growers. They are on the wrong principle, and will never hold large quantities successfully by that method. Acting on this conviction, the old packing-house of the Lemoneira Company was remodelled and new ones built on this new principle, which was to let as much air into the house as possible. This was accomplished by making the house simply a shed, with a roof and floor and no sides. The fruit is piled in blocks of about a carload each, and each block covered with a canvas, which is raised or lowered to suit the particular needs of the fruit. In this manner we are able to give each of the blocks the exact treatment that it requires, regardless of the other blocks around it. I shall not attempt to go into the details of this method; suffice it to say we have handled over seventy-five cars of lemons in this way this year—some of them being held five and six months in excellent condition, and they gave excellent satisfaction to our trade. We have not shipped lemons this year under ice, and to the best of our knowledge we are the only shippers who make a practice of shipping to the Eastern markets who have been able to do so without icing their cars.

"One of the principal reasons why so many of our Californian lemons arrive in the East in poor condition is on account of the treatment they receive in the packing-houses before they start. This is partially due to rough handling, but still more to the fact that the lemons have not received proper ventilation in the curing. The lemon should never be allowed to sweat. If moisture is allowed to collect on the fruit the stems will drop out, and the keeping quality is gone. Be sure and have plenty of air in your lemon-house, and bear in mind that it is better to have the fruit shrivel than sweat."

Opinions will probably be divided on the matter of curing accom modation for lemons. The style of building generally adopted (and found to be perfectly successful) is one in which as much light as possible is excluded, and in which there is ample provision for the escape through the grating floor of the heavy gases given off by the lemons undergoing curing. Possibly, under Mr. Teague's plan, the same provision exists, and the light is effectually excluded by means of the canvas covers. At any rate, it would be simple enough to take lemons enough for, say, ten or a dozen cases and stow them in boxes or trays in an open shed, or under a wide verandah, keeping a canvas screen well around them as suggested for a trial of the method.

Marketing.—The most successful in the lemon business have adopted a few principles which they have adhered to strictly. The following are a few of these :—

1. To put up an honest, neat, highly-graded pack.
2. To adopt a brand, and never sell any fruit packed under it that is not strictly up to grade.
3. If the fruit is known to have poor keeping quality, mark it and sell it as such. It is far better to have the decay taken out in your packing-house than to pay freight on it to the market and then have it deducted there, where it will injure the reputation of your pack and of the country's lemons in general.
4. Establish and maintain a regular trade, and always keep it supplied. This can only be done by shipping in carload lots. If your grove is not large enough for this, your only hope is to associate yourself with others for this purpose, forming a lemon association. It was for this particular purpose that the Southern California Fruit Exchange was organised. [A description of this organisation appeared in the *Agricultural Gazette* some months ago.]

Thinning the Fruit Crop.

It takes a certain amount of courage and no end of confidence in one's own judgment to set to work on a promising-looking "set" of fruit, and thin out, perhaps, nearly half of it. So long as a fruit is on the tree there seems to be some chance of profit in it, but when one sees the ground for feet about the tree literally covered with the young fruit removed to allow the remainder an opportunity to properly develop, it seems as if the prospective improved quality of the apparently very small number of fruits left cannot possibly compensate for those ruthlessly thinned out. Nevertheless, wherever thinning has been judiciously practised one year the grower has little hesitation about it thenceforward. It is, however, an operation that cannot be left to anyone to be done in a perfunctory way. It requires as much, if not more, judgment to thin a crop as to prune a tree, and unless one is prepared to go patiently over the whole tree, and remember all the time what is the object aimed at, thinning had better be left alone.

The orchardist who studies economy will really commence his thinning in the winter pruning, and he will find not only a saving of time usually devoted to thinning, but that the drain on the tree will be less if only a little more fruit than will be left for maturing is allowed to set. One of the greatest troubles in peach-growing for Sydney market is the profusion of under-sized, flavourless fruits in which the pit is out of all proportion to the flesh. Fruit of this kind hardly covers the cost of marketing, and the trees which bear it last a very short time as the drain on the tree for the production of pits is infinitely greater —weight for weight—than for flesh, and it is less expensive to produce good fleshy fruit than skinny stuff with an immense pit.

According to analysis, the flesh of a peach consists of about 90 per cent. of water and the rest of nitrogenous matter and sugar with a few other constituents, whereas the stone and kernel consist of about half water and 50 per cent. of phosphoric acid and nitrogenous matter. The same applies to apricots, and it is surely worth neither the trouble of the grower to market nor the expense to the consumer to purchase stunted fruits. We frequently hear people wondering why the marble-sized apricots and peaches are not converted into jam. Some of them are, but the result is not satisfactory simply because the old adage about the impossibility of making a "silk purse out of a sow's ear" is just as applicable in fruit-preserving as in anything else, and it is quite out of the question to make wholesome high-grade jam from ill-developed fruit.

It is also said by some that the marketing of a very low grade of fruit meets a public demand and that some dealers would rather handle the half-penny a dozen peaches or apricots than a better grade. Unfortunately there is some truth in this, but such a taste on the part of a minority of the public is fostered at the expense of fruit-growers. There is every reason to believe that if the very people who so eagerly buy wretched fruit at cut-throat prices could have a better article brought to their doors they would not hesitate about paying a fair price for it. There is a deep-rooted belief, too, in the minds of a great many that the demand for first-class fruit is strictly limited. It is very hard to find a firm foundation for that belief. In the first place, the fruit-growers of this State have never been able to fulfil the local demand for high-class fresh and preserved fruit. We import hundreds of thousands of cases annually and we never hear complaints about the glutting of the markets so far as the higher grades of fruit are concerned. In the second place, the people of New South Wales are turning more and more to fruit as a daily item in their dietary, and when people commence to take fruit as a common food and not an occasional luxury they look for a certain evenness of high quality in it just as they expect to find in the meat or the butter. In footing the bills they will be more likely to regard with favour the well-flavoured, well-nourished, better-coloured fruit that they can eat with pleasure and satisfaction to the wizened little apologies for fruit that come from trees that are allowed to overbear. In thinning, it should not be the aim of the grower to make every fruit a "prize pumpkin," but to leave on the tree, as evenly distributed as possible,

just what seems to be a medium load for it. Where the right system of pruning is followed most of the fruit will be carried on sturdy inside wood, and where such is the case a good deal more fruit can be left than when the fruit is all out on the tips of the branches. Where the fruits—more particularly apricots and peaches—are found in clusters of three or four,—two only should be left, but it is really better to leave only those that have an independent hold of the spur.

SUBSTITUTES FOR CREAM IN SKIM-MILK AS CALF FOOD.

IN response to inquiries for information as to the qualities of the various cereals ground into meal and used in conjunction with skim-milk as a food for calves, and also linseed and malt in the same connexion, the Chemist, Mr. F. B. Guthrie, reports :—None of the cereals contain sufficient oil to replace the cream abstracted. The best addition to skim-milk for feeding young calves is crushed linseed or linseed meal, and this is used very extensively and successfully in this and other countries.

The meal contains on the average :—

Water	9·2	per cent.
Ash	4·3	,,
Albumenoids	22·6	,,
Fibre	7·0	,,
Carbohydrates	23·2	,,
Oil	33·7	,,
	100·0	

Jordan ("Feeding of Animals") recommends the following proportions:—The meal is cooked in water in the proportion of one measured gallon of meal to six gallons of water. A small quantity, containing about four tablespoonsful of the dry meal, is added to about two gallons of the skim-milk as a daily ration. This applies to very young calves. The amount of meal is gradually increased until a quantity of the porridge, containing about 1 lb. of the dry meal, is added to the two gallons of milk. In six weeks the calf should receive in addition dry feed such as oatmeal or pollard, or either of these may be mixed in with the milk, the linseed being gradually discontinued. Other seeds that might replace linseed and be more readily obtainable here are sunflower seeds, which are also very rich in oil. They contain a good deal of fibre and are less digestible than linseed, but would be worth a trial. Cocoa-nut oil-cake, as sold locally, is also rich in oil, containing about 20 per cent., and might be tried with advantage.

To this Mr. O'Callaghan adds that cocoa-nut oil-cake dissolved in water and added in the shape of a gruel to the separated milk answers very well—the quantity to be used being about the same as in the case of linseed cake. Maize meal, oatmeal, and a very little linseed or cocoa-nut oil-cake made into a gruel and added to the separated milk has been used with marked success as a calf food. Care must be taken not to use linseed to excess in feeding calves—¼ lb. a day is sufficient for calves from six to twelve weeks old. Larger quantities than that have been known to injuriously affect the kidneys of calves.

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Mammoth Rye.

Correspondents ask whether Mammoth rye will make a wholesome hay, and if there is any risk of the bloom of rye when converted into hay affecting stock. At Forster it is found that rye cut when about 4 feet high scours calves rather badly. In reply, Mr. Sutton, Experimentalist at the Hawkesbury Agricultural College, states:—"What is known as Mammoth rye is really a species of wheat (*Triticum polonicum*), and it is sometimes called Poland wheat. Rye when in bloom is particularly subject to attacks of a fungus disease known as ergot. Other cereals and grasses are also affected by this disease, though not so frequently or as badly as rye. Crops thus attacked, when fed to stock, either green or made into hay, may cause abortion in pregnant animals, and are likely to cause scours or looseness in other animals. If a few heads of the plants were forwarded to the Department, they could be examined for ergot, unless one is able to detect it for himself.

"If the crop is not attacked with this disease, the hay will be quite good and wholesome if cured properly. Rye and other crops likely to become attacked by ergot should be cut for green stuff or for hay before they bloom."

Desiccated Meat.

At the instance of Dr. Creed, M.L.C., a series of experiments have been carried out by the Chemist, Mr. F. B. Guthrie, to determine—

(1.) What are the conditions under which meat can be rapidly and cheaply dried, so that (*a*) the product can be readily reduced to powder; (*b*) it is sufficiently sterilised to permit of its being packed for consumption; (*c*) its digestibility is not seriously affected?

(2.) What is the most favourable temperature for this purpose?

A considerable number of experiments were made, the details of all of which it will not be necessary to repeat. The meat was prepared in different ways, by slicing, chopping, and mincing, and was treated for different periods at different temperatures, the drying chamber being in some cases open, and in others closed air-tight so as to allow of the passage of a stream of previously-dried air during the operation. Attention was chiefly directed to performing the process as rapidly as possible, and at as low a temperature as possible, in order to avoid coagulation of the proteids and consequent loss of digestibility. Meat proteids are coagulated at different temperatures—fibrinogen, for example, coagulating at 56° C., whilst serum globulin and serum albumen are coagulated at temperatures from 75° C. to 84° C.

It has been found that at 60° C. between 60 and 70 per cent. of the total proteids in meat are coagulated, and at 70° C. the amount is 90 to 91 per cent. Temperatures above 80° C. were, consequently, discarded after a few preliminary trials to judge of the rapidity with which the drying could be effected at these temperatures.

It was found impracticable to obtain a product by drying much below 65° C. within a reasonable time, which was sufficiently dry to reduce to powder, and which would keep sweet; but at 65° C., or between this and 70° C., it was found possible to dry the meat in three to four hours in a perfectly satisfactory way.

The conditions found to be most suitable were the following:—The meat was first minced in an ordinary sausage-machine and spread out in the drying oven upon a fairly open sieve. The sieve employed was one having about six meshes to the linear inch.

This allows the melted fat to run away, and greatly expedites the drying. The oven was left open so as to allow free access of air, and after four hours drying, at a temperature of 65° C. to 70° C. (and which never rose above 70° C.), the product was sufficiently dry to be readily reduced to a fairly fine powder in an ordinary mill.

The product obtained at this temperature is a light-coloured slightly reddish powder containing 11 to 12 per cent. water, of an agreeable odour and exceedingly palatable, especially if a little salt is added. It keeps perfectly in stoppered vessels, a sample prepared in a very similar way in June, and placed in an ordinary-corked flask, is still perfectly sweet four months later, though the cork has been frequently removed during that time.

If packed in air-tight tins, or in tins from which all air has been excluded, there is every reason to suppose that the powder will keep for an indefinite period.

The time taken in drying could no doubt be considerably shortened if a fairly rapid current of dry air were passed through the drying-chamber during the process. This was not found practicable with the appliances available, as it was impossible to prevent the accumulation of moisture on the walls and ceiling of the oven.

Digestibility of the Meat-powder.

It was thought that by keeping the temperature below 75° C. the proteids might be coagulated without rendering them insoluble. Meats prepared by drying in the sun, such as "pemmican," "chargue," "biltong," &c., are not regarded as indigestible.

It was found on subjecting the dried meat-powder to the action of an artificial digestive fluid that the results obtained were practically identical with those obtained with raw beef.

Twenty grammes of the powder were digested for three hours at 40° C. in a litre of 0·2 per cent. hydrochloric acid containing 5 grms. pepsin. The residue after filtration amounted to 0·8 grms., the amount dissolved in the digestive fluid being 16·8 grms., or 96 per cent. when calculated to dry substance (the powder contained 12 per cent. water). The same experiment with 20 grms. fresh raw beef (containing 70 per cent. water) yielded 5·8 grms. dissolved, or 96·6 per cent. when calculated to dry substance.

There is therefore no doubt that drying at the temperature employed (65° to 70° C.) does not in any way impair the digestibility of the meat.

Depth to Cultivate Maize.

Everyone is well aware that the frequent use of the cultivator is of great service in maintaining the steady growth of maize crops. It is well to remember, however, that as the crop advances the depth to which the tillage implement is set to stir the soil should be gradually diminished to avoid cutting the network of roots that almost fill the space between the rows and run quite close to the surface.

For the guidance of those who have not already studied the question, illustrations of the rooting of a maize plant at various stages

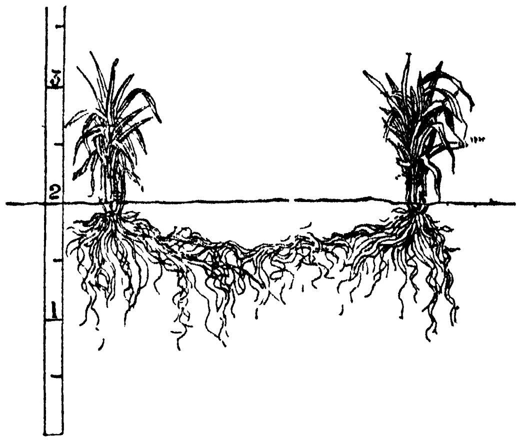

Fig 1.—Maize roots 20 days after planting.

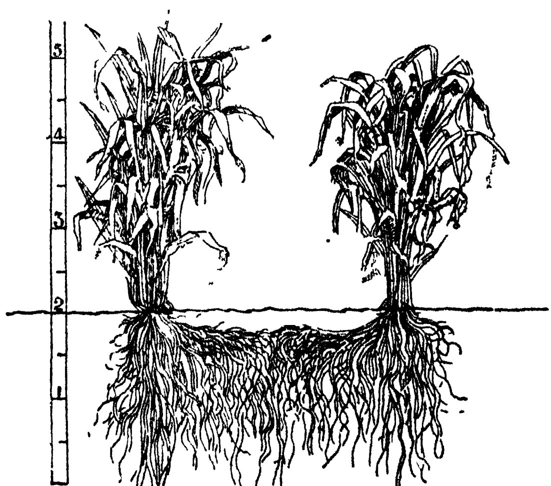

Fig 2. Maize roots 55 days after planting.

of growth are reproduced from an article which appeared in the *Gazette* for October, 1900.

Johnson Grass (*Sorghum halepense*).

As a permanent crop for isolated corners of the farm, and especially for station properties, Johnson Grass is worthy of some attention. In moist soils it yields very good cuttings of green fodder and seems to be always growing fast. It will also make a palatable hay, though on account of the risk of spreading the seeds, this method of utilising Johnson Grass is not to be recommended. If anyone had a tract of swamp land and established Johnson Grass on it, he would have an ideal spot for pig-raising. Pigs are extremely fond of the fleshy roots, and will thrive on them, while the tenacity of the grass itself is so great that, on a fair sized area, the continued rooting of the pigs will not materially affect the quantity of fodder this grass is capable of producing. But despite the many good qualities of Johnson Grass: its drought-resistance, its ability to thrive and produce food above and below ground in swamps only fit for innutritious sedges, the vigour of its succulent growth when lots of other fodder plants are dead to the world, and the fact of its ranking so high as a food for horses, cattle, and pigs, it would be well to bear in mind the warnings of such authorities as Professor Lawson-Scribner, U.S.A. Department of Agriculture, and Dr. J. B. Killebrew, of the Tennessee Agricultural Experiment Station.

Professor Lawson-Scribner says: "The objections to the cultivation of Johnson Grass are the rapidity with which it spreads to fields where it is not wanted, and the great difficulty in eradicating it when it has become established. It will soon almost disappear when fields are depastured, but the roots remain alive, and will again take possession of the field as soon as it is ploughed. Instances are known where fifteen and even twenty years of continuous pasturing have failed to produce any appreciable effect on the vitality of the roots. When there are only occasional small patches of it in a field they can be destroyed by hoeing and covering with salt to a depth of half an inch, but when it covers any considerable portion of a field, the only practicable method of destroying it is by weekly hoeings continued from early spring to late summer. In sandy soil it can be effectively destroyed in this manner, but when the soil is heavy and thick, the work is more difficult."

Dr. J. B. Killebrew in "Grasses and Forage Plants" says:—"While it makes excellent hay, and furnishes a large amount of grazing, it is at the same time one of the most troublesome weeds that can be introduced upon a farm. If one wishes to raise nothing but hay, if he has no regard for the rights of his neighbours, if he expects never again to grow tillage crops on his farm, then the wisdom of sowing Johnson Grass is to be commended, otherwise it should be left severely alone, for no time will ever completely eradicate it when once established in good land. It has a thick, fleshy rootstock, which penetrates the ground in every direction, and throws up a culm from every joint. If a single piece of root an inch long is left in the ground it will be the prolific mother of a numerous progeny of stalks and roots within a year. It is possessed of strange and extraordinary vitality. A barrel

of salt poured upon a bed of it 8 feet square did not destroy the roots. Within a month the salt disappeared, leaving a briney surface, but the invincible roots sent up an army of numerous stalks that waved their flags of victory over the bed that was intended to be their grave. The only way to keep the grass in subjection is to pasture it with hogs, and never let it go to seed."

SEED SELECTION.

IN these days of agricultural progress we too often overlook the importance of seed selection. We frequently hear the complaint, "My seed has run out, and a change is needed." This is caused in some cases by a failure to adapt the grain to the correct soil type, but the principal cause of deterioration is inferior seed sown on poorly-prepared ground. We have made a careful study of the impurities of seed grain from several sections of the country. In many instances one-quarter of the sample consisted of impurities that could be removed by means of a hand sieve. When hand-cleaning was practiced the percentage of poor seed often reached one-half. This is a direct loss to the man who sows the seed. It is just like throwing away one-half of the cost price. Then every seed that produces a weak plant might be considered a weed in one sense, for it is taking up room and robbing the soil of plant-food and moisture.

If a man is careless enough to sow poor seed it generally follows that he will be negligent about the preparation of the soil. Under such management the initial vitality of a new and vigorous variety is soon dissipated. The grower's profits correspond, and, of course, the only apparent remedy in the minds of many is a change of seed. Just how long a variety can be grown on the same ground without diminishing in yield, and what advantage there is in interchanging seed between the several soil types are questions not yet solved. There are so many soils that a variety of grain that could be sown with profit for a number of years on one kind might deteriorate very rapidly on another of poorer quality and *vice versa*. Consequently the seed would have to be changed in order to keep up the yield. This is a line of investigation that we hope to carry on at this Station if we can find the various types of soil conveniently situated for this work.

Actual tests have established the fact that, by practising a careful selection of seed, the yield of a variety may not only be maintained but increased for a number of years. I have seen the same variety of grain grown for ten years in succession on the same farm, and yield more per acre in the last five than in the first five years. This grain was not selected from the head, and, hence, we would naturally expect much better results were this method of selection practised. This does not prove, however, that we need not change seed under any circumstances. This particular variety might have improved in yield and quality if it had received the treatment described, and then been changed and grown in a different section of the country for two or three years, and then brought back to the original soil.

People, as a rule, are too careless about their seed grain. Generally all the grain made is fed or sold, and then just before planting the farmer goes to town and buys seed grain irrespective of variety, quality, or conditions under which the grain was grown. If our farmers would secure a good variety of grain, practise a good system of selection of seed, and thoroughly cultivate the soil, there would be no need for a change for several years at least. In this case they would have a larger yield of grain, run less risk of getting bad weeds on their farms, and save the money that they would otherwise spend in buying seed grain every year or two at fancy prices.—P. O. VANATTER, in the *Bulletin* of the Tennessee Experiment Station.

FLIES.

AN American farmer, whose conditions appear to be very similar to those of New South Wales, has been figuring out what it costs him per season to entertain flies. His conclusions, which appear in the *American Agriculturist*, are worth reading. He says:—"Last year I was able to keep up the milk flow through August (midsummer in America), notwithstanding the fact that the falling off of milk at the factories was more serious than any year previous, principally on account of the flies. I was no more immune from flies and dried-up pastures than any other locality, yet through August my milk flow was but 1½ lb. per cow per day less than in the flush of June pasture, and this with cows which calved in the spring. I used pure kerosene oil, and think it is the simplest, cleanest, and most potent remedy among the many fly preventives in use. I use a common tin hand spray that holds a quart of liquid, and it is but the work of two minutes for each cow to spray them for flies every day. When flies are very persistent I spray twice—morning and night—as kerosene evaporates very quickly. One quart of kerosene is sufficient to spray ten cows once and costs 5 cents, or ¼d. per cow.

"To test the value of the kerosene spray from an economical point of view, I have occasionally desisted from spraying. On these occasions the cows were pretty well covered with flies, though sprayed the previous evening. On the following morning the milk flow fell off an average of 2 lb. per cow and at night about 3 lb. from the daily average for the week. That showed a loss of 5 lb. milk per day, notwithstanding the fact that the cows were fed an abundance of green feed at each milking. I am satisfied that a ½-cent's worth of kerosene oil and two minutes' time give 5 lb. milk, which to me is worth 5 cents. I have previously tried fish oil and other ingredients as a fly-preventive, but find such oil mixtures are nasty to apply, and emit a disagreeable odor, besides attracting dust and sand on the cows' bodies.

"One day, last summer, I was out of kerosene, and having no other oily ingredient at hand save tallow I melted a quantity on the stove, and to cause a pungent smell added about 2 tablespoonfuls turpentine to 1 pint melted tallow. This I applied to the cows while warm and found it had a splendid effect in warding off the flies, and what was more, the weather being wet at the time, found it to be the most

lasting fly-preventive I ever tried. It forms a scale, or coat, on the hair that withstands the attack of flies, and for wet or rainy weather appears to be much ahead of kerosene. The wet apparently increases its adhesive qualities. But it is nasty to apply and takes a much longer time. A brush is not very good to apply it with, so, for best effects, it must be applied with the hand. Have the tallow mixture and liquid warm and apply to the withers, front sides, belly, fore-legs, and horns with the palm of the hand. The tallow mixture is withal somewhat dear, so I only use it in wet weather and depend almost wholly on the kerosene spray."

SOMETHING ABOUT PIGS.

FROM 1st January to 30th September, 1902, there have been imported into New South Wales 1,191,284 lb. of bacon and hams, and goodness only knows how much pork in the shape of tinned sausages, &c. A couple of weeks ago a cable appeared in one of the daily papers to the effect that some enterprising American pork dealers were prepared to ship lots of a couple of thousand carcases of pork at a time to Sydney at cutting rates. From these two facts it is only to be inferred that local farmers are not taking all the steps they might to cater for the requirements of the markets at their own doors, which is a pity. The temporary scarcity of beef and mutton, which is likely to exist for a considerable time, is naturally creating a very largely-increased demand for pork, fresh and cured. The writer has now before him three or four text-books on pigs, the reports of half-a-dozen agricultural experiment stations in the States of America (where pigs are turned out by the million, and pork-raising and curing is a foremost national industry), long reports on the experiences of Canadian farmers (who send hundreds of thousands of pounds worth of bacon and hams to England every year), Danish reports, French reports, the opinions of leading British bacon curers and pig farmers, the opinions of firms and trusts like Armour's, Elmore and Cooper, Drover's, Gillespie, Scruggs-Hall, and others who control the Chicago trade, and, finally, a pretty fair collection of reports and observations by practical pig farmers, bacon curers, and pig stud-masters in this State and New Zealand. From every detail and phase of this mass of information it is clear that in the essentials of cheap food production, housing and general management, healthiness, rapid growth and thrift, new infusions of reliable blood at low cost, facilities for practical instruction in all branches of the industry, the coastal districts of New South Wales easily take first place. Instead of bacon and hams and fresh pork coming into this State, we ought to be meeting all Australian demands and exporting thousands of tons to all the great pork-consuming countries of the Old World.

In the eastern parts of the United States, where the rainfall is ample and the conditions to a certain degree might be compared with those of our coastal districts, the pig farmer has not a big and rapidly-expanding dairy industry such as ours to provide him very cheaply with one of his main pig-foods. Other branches of agriculture have

been established there which do not fit in so well as dairying with pig-raising, but still the farmers market a few million pigs. In the colder States, where the bulk of American dairying is carried on, the severity of the winter necessitates housing and hand-feeding for many months at a stretch; the same applies to Canada, Britain, and Denmark. From Tweed Heads to Cape Howe, and right up to the Dividing Range, for two-thirds of their farm-life, pigs can forage for themselves out of doors every month in the year, and in the yards and sheds in which our pigs are quite comfortable during the topping off for market, the denizens of colder countries would probably be frozen to death. Our pigs, owing to the mildness of climatic conditions, which permit of plenty of range and exercise, are not so subject to disease, and happily the hog cholera, which devastates the pig herds of the United States, is not to be feared.

In this *Gazette* there have been a good many articles about pigs and their food and management. The following, which is written by Prof. Henry, Director of the Wisconsin Agricultural Station, is well worthy of study as showing what knowledge on certain important points a farmer who wishes to succeed at pig-raising should possess. Prof. Henry is generally regarded as one of the greatest authorities on pigs:—

"The successful hog feeder must keep in his mind a good many scientific as well as practical facts if he is to make the most out of his business. In regard to feeding stuffs, he should clearly distinguish at all times what nutrients the various articles furnish, and what his animals require. He early learns in studying the subject that such feeds as skim-milk, butter-milk, middlings or ship stuff, gluten feed, peas, and oats are all rich in protein, which goes to build up the muscles or the red meat of the body, and also rich in ash, which builds up the bony framework. Grasses and clovers used for pasture purposes also assist swine in building up their bodies. Maize is *par excellence* a carbohydrate and fat food, its purpose in feeding being to build up the fatty portion of the animal body and to aid in keeping it warm. Wheat and barley are intermediate, furnishing considerable muscle and bone-building material, while being largely of a fat-building order.

"With this explanation we can easily understand why brood sows before farrowing and while suckling their young, and growing pigs, both before and after weaning, should all receive a liberal supply of such feeds as are named in the first list. The best of all these feeds for young pigs, all things considered, are skim-milk and butter-milk, for Nature intended milk for young animals. Skim-milk is likewise useful for feeding fattening hogs. As an average of many trials conducted by the writer, it was found that 475 lb. of skim-milk fed in connection with corn meal saved 100 lb. corn meal with fattening hogs. Next to skim-milk for growing pigs comes wheat middlings (ship stuff), which feeding stuff is most appetising and highly appreciated. Rich in ash, it builds up the bones, and carrying much protein, it favours muscular development. Most swine feeders can secure from one source or another either skim-milk (or butter-milk, which is

practically the same thing) or middlings. With these feeds they are able to produce good shotes (young pigs in store condition).

"In autumn many farmers are directly interested in the question of fattening their hogs. Their pigs have reached the period where they are called shotes, and having built up good frames of bone and muscle, they await fattening. Cheapest of all feeding stuffs for fattening hogs generally available in our country is Indian corn (maize). The supremacy of America as a pork-producing nation is due to Indian corn and to its great fattening powers. About 500 lb. corn will produce 100 lb. gain with shotes. If they are lean but healthy, and with vigorous appetites when the feeding period begins, they will lay on the first gains at the rate of 100 lb. gain for 400 lb. of shelled corn. If high feeding continues more than seven or eight weeks, and the pigs are then quite fat, it will require nearly or quite 600 lb. of shelled corn for 100 lb. of gain.

"Many farmers query whether or not it pays to grind corn for hogs. I have been experimenting for five years and find varying results. Sometimes there has been an actual loss by grinding the corn to meal for fattening hogs, and other times quite a considerable gain. In general, for healthy, vigorous hogs, lean in flesh, grinding the corn does not seem to pay, while if we wish to push the animals ahead rapidly we can get them to eat more feed and make somewhat faster gains by reducing the corn to meal by grinding. Of course old or hard corn should always be either reduced to meal or well soaked before feeding. Where the fattening period is to continue as long as eight weeks, some skim-milk, middlings, oats, or other secondary feeding stuff should be given. Such feed not only furnishes nutriment, but increases the palatability of the feed, and aids, apparently, in the work of digestion. Two feeds always give better results when given together than each would if fed separately. Fattening swine, especially those getting much corn, should always be fed some salt, and it is important that they have a supply of such substances as wood ashes, hard coal ashes, corn-cob charcoal, etc., even lime, soft brick or soft sandstone are eagerly eaten and seem to have a good effect. Perhaps these substances correct acidity of the stomach, or they may be useful in killing intestinal worms. At any rate, since there is a strong craving for them, and the animals seem to thrive when such substances are supplied, they should not be withheld.

"Outside of the corn districts barley will prove a most useful grain feed for swine. The Danish experiments, and the experience of Canadian farmers, in producing fine pork all confirm the high value of barley in the quality of pork it produces. For mere increase in weight, corn leads barley by about 8 per cent., but corn pork is softer and of not so high quality generally as that made from barley. Wheat is about equal to corn for pork production so far as making gains are concerned. Both the wheat and barley are useful in feeding young pigs, because they contain considerable protein. Oats are a useful feed in the hands of the intelligent pig raiser. Shotes, and especially breeding stock, are apt to lie too much of the time in their warm beds in the winter and not get enough exercise. They can be forced to

take exercise by sprinkling oat grains thinly over a feeding floor. The animals will then have to pick up the grains one by one, and in doing so will be compelled to remain on their feet and walk about considerably. For very young pigs, the oats should be ground and the hulls removed by using the sieve. The part removed can be fed to cattle, so there is no waste. Young pigs can be fed oatmeal, made into porridge with warm water, and on this food they will thrive amazingly. Such meal is an excellent substitute for skim-milk or middlings; or better yet, it can be fed in combination with them or along with the corn or corn meal.

"I do not wish to be understood as saying that young pigs should have no corn. When feeding skim-milk, middlings, &c., a third of the nourishment for these young animals can be made up of corn and corn meal; and as they get older the proportion can be increased, until with hogs shut up for fattening, two-thirds or three-fourths of the ration can consist of corn.

"The excessive use of corn with young pigs is plainly shown by the weak bones they possess and their over-fat condition while young. In some feeding experiments made years ago I fed pigs after they had reached 100 lb. exclusively on corn from twelve to fifteen weeks. When these pigs were killed their bodies were found to be a mass of fat, and their bones were greatly weakened, as was found by testing them in a machine made for such purposes. They were different looking animals from others of the same litters which had been fed during the same time on a variety of feeding stuffs.

"It is not difficult to believe that pigs whose bones are weakened, and whose muscles are but partially developed through imperfect feeding, are more susceptible to hog cholera than animals in full vigour through exercise, pasture, and liberal feeding with a variety of nutritious foods. While poor feeding will not, and cannot, develop hog cholera in and of itself, it can certainly put the animals into a susceptible condition when that dread disease appears.

"The same applies to other diseases and ailments. If the general vigour or constitutional stamina is lowered by unsuitable food or treatment, disease more easily obtains a footing."

Market Review.

14 November, 1902.

POULTRY, &c., received at the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits.	Hares.
1902.					pairs.	
January	6,266	1,677	197	372	576	....
February	12,593	3,416	326	297	....	....
March	17,228	2,087	324	846	6,502	80
April	25,011	4,916	257	186	9,751	896
May	22,605	2,382	42	440	36,828	1,800
June	9,754	971	26	288	32,756	17,848
July	3,484	35	4	74	18,060	17,064
August	1,068	5	5	53	7,522	20,484
September	337	....	....	....	310	6,084
October	....	45	41	65	....	192
Totals	98,346	15,534	1,222	2,621	112,305	64,448

Besides the above, the following were received :—

1902.		
January...	270	packages butchers' sundries.
February	296	,, ,,
March	655	,, ,,
April	225	,, ,,
May	218	,, ,,
June	187	,, ,,
July	64	,, ,,
August	23	,, ,,
September	37	,, ,,
October	21	,, ,,
Total	1,996	,, ,,
September	778	cases eggs.
October.	1,217	,, ,,
Total	1,995	,, ,,

POULTRY, &c., delivered from the Government Cold Storage Depôt.

Date.	Fowls.	Ducks.	Geese.	Turkeys.	Rabbits.	Hares.
1902.					pairs.	
January	9,548	1,166	183	170	1,566	96
February	12,921	1,075	563	517	348	300
March	11,833	2,018	390	630	3,709	136
April	10,645	2,192	332	213	4,896	122
May	22,944	3,172	89	479	8,679	972
June	5,383	459	28	226	15,699	5,248
July	7,296	3,684	54	303	57,510	18,288
August	2,407	3,152	5	27	14,280	21,404
September	2,099	316	....	56	10,282	26,088
October	12,442	50	6	16	641	2,156
Totals	97,521	17,284	1,650	2,637	117,610	74,810

Besides the above, the following were delivered :—

1902.		
January	 609	packages butchers' sundries.
February	 262	" "
March ...	 667	" "
April ...	 225	" "
May ..	 234	" "
June ...	 161	" "
July ...	 215	" "
August ...	 37	" "
September	 48	" "
October	 21	" "
Totals	 2,479	"
September	... ...	125 cases eggs.
Total	... ...	125 " "

In 1901 the deliveries of rabbits from the Government Cold Stores amounted to 80,351 pairs; this season, to October 31st, 1902, 117,610 pairs of rabbits have been delivered, or an increase of 37,259 pairs. The quantity for export would have been much larger but for the unprecedented local demand.

Messrs. Weddel & Co.'s Dairy Produce Review for the year ending 30th June, 1902, says:—

Quality of Butter.—The best friends of the Australian Dairy Produce trade cannot but regret that the steady improvement in the quality of butter which Australia exhibited regularly until last year, has not only ceased, but on the whole has actually receded. It is true there are certain factories and a limited number of brands which are equal in quality to anything formerly received, but the bulk of the butter is inferior to what it was only two years ago. The reason of this may be attributed in some degree to the continued droughty conditions that have been so disastrous to agriculture generally in Australia; but the main reason for deterioration in quality is the increasing use of the private separator. In a hot climate like Australia the result of farmers separating their own cream and delivering to the factory at irregular intervals is certain ruin to the manufacture of perfect butter. It is contrary to common sense and opposed to every scientific method to expect a vat of cream which contains cream of three or four different ages, all blended together, to produce as good butter as a vat which contains cream all of one age. To mix ripe, over-ripe, and doubly over-ripe cream together, as results from the use of private separators, and to expect that it will produce as good butter as only ripe cream, is to show utter ignorance of those principles of fermentation on which the flavour and keeping qualities of all butter absolutely depend. The machinery agents in Australia who have pushed private separators on the farmers have done an incalculable injury to Australian butter, and, unless this policy is immediately reversed the quality of Australian butter is doomed to occupy a secondary position in British markets.

BRITISH Imports of Colonial Butter during the Australasian butter season.

Season.	Australia.					New Zealand.	Canada.	Grand Total.
	Victoria.	N.S. Wales.	S. Australia.	Queensland.	Total Australian			
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1894–95 ...	205,308	26,338	11,633	—	243,279	46,093	17,979	307,351
1895–96 ...	143,651	1,058	6,984	—	151,693	51,166	31,067	233,926
1896–97 ...	140,701	32,316	1,393	1,273	175,683	61,763	66,810	304,256
1897–98 ...	106,745	44,685	163	5,757	157,350	73,607	85,050	316,007
1898–99 ...	145,358	41,703	3,312	2,749	193,122	81,332	121,989	396,443
1899–00 ...	252,703	76,410	7,722	7,306	344,141	149,290	146,444	639,875
1900–01 ...	227,024	71,831	5,749	1,262	305,866	145,033	65,588	516,487
1901–02 ...	116,351	32,365	1,725	2,937	153,378	146,137	130,879	430,394

British Imports.

(Year ended 30th June, 1902.)

Butter.—The increase in the imports of butter into the United Kingdom goes steadily on. Sometimes this increase is large, as in the year ended 30th June last, when it amounted to 12,448 tons, or an average increase of more than 1,000 tons a month. The following statement of the increase for each of the past ten years demonstrates the capacity of British markets for absorbing the surplus of butter produced in other countries.

	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
Tons (increase) ..	7,001	7,964	11,453	11,661	10,713	2,247	5,479	6,754	3,598	12,448

The increase in the imports of the year just closed is thus seen to be the greatest in the decade. In the year 1892 the total imports were 108,119 tons, and now they have reached 187,907 tons, which shows a growth of 79,988 tons in ten years.

The country which shows the greatest increase for the year just ended is Russia, with an addition of 9,392 tons, nearly altogether from Siberia. Denmark stands next with 7,093 tons, and then comes Canada with 3,959 tons. France follows with 1,482, Argentina with 1,477 tons, and Holland with 960 tons. No other country sent an increased quantity except Norway, and that was only 126 tons. Among the countries showing a deficiency compared with last year Australia takes the lead with a reduction of 8,107 tons, the United States follows with 1,706 tons, Sweden with 1,093 tons, New Zealand with 617 tons, Belgium with 222 tons, and Germany with 47 tons. Various other countries, whose total imports this year were only 131 tons, contributed to our supply 239 tons less than in the previous period. It is interesting to note that for the year ended 30th June, 1902, the imports of New Zealand butter for the first time exceeded those from Australia, the actual receipts being 8,295 tons and 7,449 tons respectively.

If the sources of our butter imports be divided into colonial and foreign it will be found that only once in the last decade have the foreign imports been less than in the year before, and that took place in 1900 when the deficit was 8,236 tons, in the following year an increase of 9,502 tons occurred, and this year the foreign supply shows the enormous increase of 17,213 tons. Colonial imports in the last decade have four times been below the previous year, and on three of these occasions the deficiency was due to Australia. The total colonial supply rose from 9,000 tons in 1893 to its climax of 37,500 tons in 1900, since then it has declined to 27,000 tons in the present year.

The most gratifying feature of the Australasian Butter Season, which closed at the end of April, was the establishment of an absolute record for high prices. On the London market "choicest" grade quotations averaged for the season 109/6 per cwt., thus excelling the previous year which which held the record at 108/5. Unfortunately, against the record of high prices is to be set a season of great diminution in supplies, which totalled only 14,976 tons against 22,545 tons for the season 1900-01. This shortage is due solely to the falling off in the Australian import. The season in the Commonwealth was exceptionally droughty, and the amount of butter received was only 50 per cent. of that imported during the previous season. The first vessel carrying Australian butter did not arrive in London until 26th October, against the 18th August of the preceding year, and the last vessel of the season reached London 1st March, while year before it was not until 14th May that the final shipment arrived. Thus the Australian season, 1901–02, consisted of only 126 days. Its immediate predecessor was a long season, and lasted for 269 days. The New Zealand season, which is always about a month later than the Australian, was slightly short of its normal length, commencing with the first arrival on 18th November, and closing with the receipt of the final shipment on 23rd May, which shows a season of 186 days, being thus one-third longer than the Australian. The total amount of butter received during the past season from Australia was only 7,669 tons as against 15,593 tons the season before. New Zealand arrivals amounted to 7,307 tons, or only 362 tons less than those from Australia. Thus the two branches of the Australasian Butter trade contributed about equal amounts to the British market. The nearest approach to equality previously attained was in the season 1897–98, when New Zealand receipts were 4,187 tons below those from Australia. In the season 1900–01 Australia sent 8,042 tons more than New Zealand, an excess greater than the total Australian receipts during the past season.

How seriously the drought in Australia, and the increasing requirements in South Africa, have affected the imports of butter from the Commonwealth for the past three years is demonstrated by the fact that Australian supplies to British markets for that period have been 17,208 tons, 15,293 tons, and 7,669 tons respectively. New Zealand, although free from drought, has been called upon during the past two seasons to divert considerable amounts of butter to Australia and South Africa, and consequently the New Zealand imports into the mother country have not exhibited the expansion of former years. The exact amounts received during each of the past three seasons were 7,465 tons, 7,252 tons, and 7,307 tons respectively.

Wholesale Market quotations, Sydney, are :—

Wheat—5s. 4d. per bushel.

Flour—£11 per ton.

Oats—Milling, 3s. 10d.; Tasmanian feed, to 3s. 8d.; New Zealand, 3s. 9d.; Local Algerian, 3s. 6d. per bushel.

Maize—Local, to 5s. 9d.; Argentine 4s. 9d. per bushel.

Barley—Feed, 4s. 3d.; malting, 4s. 6d. per bushel.

Bran—1s. 7d.; pollard, 1s. 10d. per bushel.

Chaff—to £6 12s. 6d. per ton.

Oaten Hay—to £9 per ton.

Lucerne—Hunter River, £4 5s.; extra choice, to £6 per ton.

Potatoes—Tasmanian, to £8; Victorian, to £7 10s. per ton.

Onions—Victorian, to £5 5s.; American, to £6 per ton.

Butter—Pasteurised, 11d.; prime, 10½d. per lb.

Eggs—1s. per dozen.

Cheese—Choice, 9½d.; medium, 9d. per lb.

Bacon—1s.; flitches, 11½d. per lb.

Ham—In cloth, 1s. 2d.; New Zealand, 1s. 1d. per lb.

Poultry—Fowls, to 3s. 9d.; roosters, to 4s. 6d.; ducks, to 4s. 6d.; geese, to 7s.; turkeys, to 7s. 6d.; gobblers, to 11s. per pair.

Honey—3½d. per lb. for choice.

Lemons—Choice, 20s.; good, 15s. per gin-case.

Oranges—Prime local, 14s.; good, 11s; small, to 5s. per gin-case.

Apples—Local, 6s. half-case; American, 15s.; Tasmanian, to 11s.

Strawberries—Local, to 4s. per four-quart box.

Pine apples—Large, 9s.: common, 8s. per case.

Bananas—Queensland, to 3s. per bunch; 6s. to 9s. per case.

Apricots—Prime, to 9s.; extra, to 10s. per half-case.

Peaches—China, to 9s. per half-case.

H. V. JACKSON,
Secretary, Board for Exports, Sydney.

AGRICULTURAL SOCIETIES' SHOWS, 1903.

Society.	Secretary.	Date.
Gosford A. and H. Association	H. McIntyre	Jan. 23, 24
Kiama Agricultural Association	Jas. Somerville	" 24, 26
Wollongong A., H., and I. Association	J. A. Beatson	" 29, 30, 31
Lismore Agricultural Society	T. M. Hewitt	Feb. 3, 4, 5
Berry Agricultural Association	A. J. Colley	" 4, 5, 6, 7
Alstonville Agricultural Society	Frank H. Bartlett	" 10, 11
Moruya A. and P. Society	John Jeffery	" 11, 12
Manning River (Taree) A. and H. Association	S. Whitbread	" 11, 12
Nowra A. and H. Society	R. Lemming	" 11, 12
Ulladulla A. and H. Association (Milton)	C. A. Cork	" 18, 19
Pambula A., H., and P. Society	J. B. Wilkins	" 18, 19
Candelo Agricultural Association	C. H. Brooks	" 25, 26
Tumut Agricultural and Pastoral Association	Bland Clayton	" 25, 26
Robertson Agricultural and Horticultural Society	R. G. Ferguson	" 26, 27
Bega Agricultural, Pastoral, and Horticultural Society	J. Underhill	Mar. 4, 5
Berrima District A., H., and I. Society	J. Yeo	" 5, 6, 7
Bombala Exhibition Society	R. M. Cook	" 10, 11
Central New England P. and A. Assoc. (Glen Innes)	Geo. A. Priest	" 10, 11, 12
Quirindi District P., A., and H. Society	Geo. Naughton	" 11, 12
Tumbarumba and Upper Murray P. and A. Society	J. J. McAlister	" 11, 12
Port Macquarie and Hastings District A. and H. Society	J. Y. Butler	" 12, 13
Goulburn A., P., and H. Society	J. J. Roberts	" 12, 13, 14
Gundagai P., A., H., and I. Association	A. Elworthy	" 18, 19
Blayney A. and P. Association	H. R. Woolley	" 18, 19
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[9 plates.]

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